

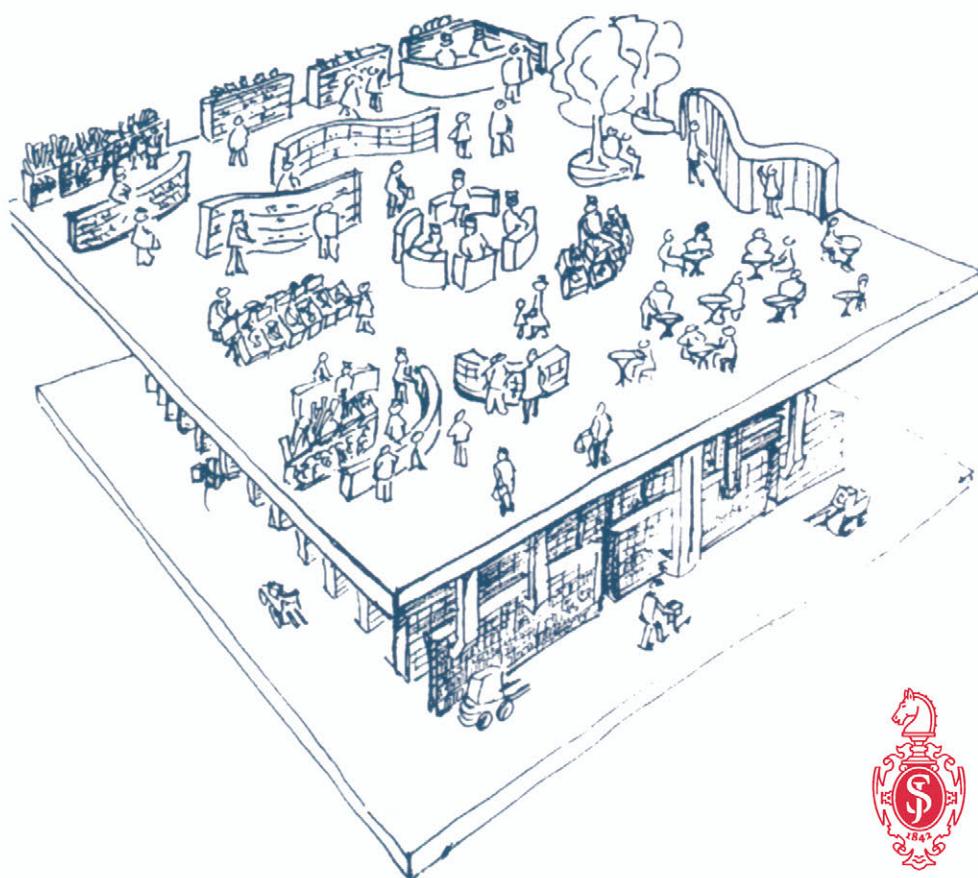


# Inclusive Design

## Design for the whole population

Edited by:

John Clarkson  
Roger Coleman  
Simeon Keates  
Cherie Lebon



Springer

# **Inclusive Design:**

## design for the whole population

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# Inclusive Design: design for the whole population

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# Foreword

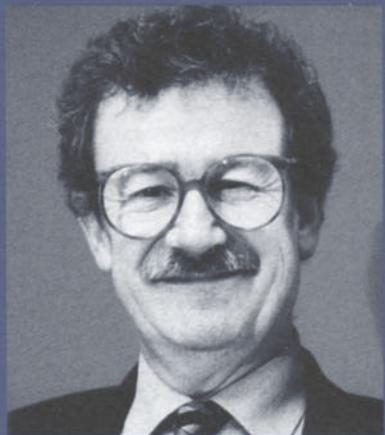
The challenge of designing inclusively for the whole population is not just a matter of social urgency – it has become one of the defining business priorities of the age. The social argument plus the business argument have in my view become inevitable

We are now living in a world of rapidly ageing populations with a broader range of physical and cognitive capabilities than ever before. Allied to this, we are in the grip of potentially alienating technologies and face the cultural upheavals that accompany the emergence of new patterns of living and working. We depend on technologies more than ever before: we understand less about tech-nologies than ever before. A big recipe for problems ahead.

The need has never been greater for products, services and environments to be developed in such a way that they do not exclude, but instead reflect more accurately the diverse demands of today's users – particular older and disabled people. That is why economies and governments around the world are now recognising the importance of a movement we in Europe call inclusive design – and in America and Japan they call universal design.

The challenge of inclusive design is not just about offering equality of social opportunity. There is also a huge business opportunity. Markets previously excluded by design are large and growing – and will reward those manufacturers and service providers who bring them in from the cold. All of this explains why the Design Council and the Department of Trade and Industry within the UK government take the subject of inclusive design very seriously indeed. The stakes involved are now sky high.

This book represents a powerful contribution to knowledge in a young and flourishing field. It covers all the bases and is truly international in scope. Importantly, its contributors include academic researchers, business managers and professional designers – the three main constituencies whose collaborative project must be jointly to create a more inclusive future for us all.



Professor Sir Christopher Frayling  
Chairman, Design Council  
Rector, Royal College of Art

# Preface

As you settle down to read this compendium of principles, perspectives and practical guidance on inclusive design, you might like to know how it all came about. This book is a major outcome of a three-year research project in the UK jointly undertaken by the Design Council with the Helen Hamlyn Research Centre at the Royal College of Art, the Engineering Design Centre at Cambridge University and the Design for Ability Unit at Central St Martins College of Art.

Entitled *i~design*, the project was funded by the EPSRC (Engineering and Physical Sciences Research Council) with a view to demonstrating the growing market potential of inclusive design, encouraging its take-up by mainstream manufacturers and service providers, and offering tools and information on the subject to design professionals. A major catalyst for the project was the DTI's Technology Foresight programme. This identified population ageing as a key driver of change and led to the EQUAL research initiative, which was taken up the UK's government-funded research councils, the EPSRC among them.

In its structure and contents, this book clearly reflects the objectives of the *i~design* study. Its three main sections map out first, the business context in which inclusive design operates, and then a set of design methodologies that will enable designers to make their work more socially inclusive. Finally, a series of views on the future present a roadmap for change in the years ahead.

Inclusive design is presented here neither as an entirely new genre of design nor as a separate specialism. It is framed within a more generalist approach to designing in which designers simply ensure that their products and services address the needs of the widest possible audience, irrespective of age or ability.

I say 'simply' but inclusive design is anything but. In fact it is a highly complex field incorporating many



Lesley Morris  
Design Learning Manager,  
Design Council

different facets and viewpoints. That is why you will find different contributions in this book covering the same ground from different angles to reflect the healthy diversity of opinion and approach that has grown up around the subject.

As one of the many insightful papers reminds us: “Inclusive design is about culture and cognition, not just about mobility and dexterity.”

In terms of study, the field is still relatively new and untried but that is changing rapidly as universities, research institutes, commercial companies and government departments all focus their attention on ways to break the old consumer stereotypes of one-size-fits-all.

In the first section, *The Business Case*, you will hear the voices of users traditionally excluded from the design process, investigate the demographic, legal, and technological drivers of change, and learn why major organisations such as Fiat, BT, Royal Mail and BAA have taken the inclusive design message on board. In addition, the European context will sit against the experiences of Japan and the United States.

The second section, *A Design Toolkit*, quantifies the extent of design exclusion in the whole population and explores strategies to counter it. A range of observational, ethnographic methods in design is presented to capture the richness of the user experience. Alongside other resources for designers, an empathic design model is described which teams designers with critical users.

Finally, *Where Next?* anticipates the impact of emerging technologies and embryonic standards on inclusive design practice in the future. A glossary of terms aids the reader in grasping key concepts, methods and chronologies.

*Inclusive Design* plants the flag of universal needs and expectations firmly at the summit of global business development and I am grateful to its quartet of editors and to its many distinguished contributors for sharing their knowledge and ideas in this way.

There is still more work to be done in both future research and in applying the ideas and principles to products and services that are generated by businesses and government. This is a starting point – now read on...

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The i~design programme brings together researchers in engineering and design from the University of Cambridge, the London Institute, the Royal College of Art and the Design Council, and the research team would like to thank the many members of staff, researchers and students of those institutions who have supported them in their work and contributed to the programmes described in the book. In particular, special thanks must go to the i~design Steering Group which has supported and guided the research team throughout.

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# Introduction

## **From margins to mainstream**

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## **Disabled by design**

Although the academic and broadsheet worlds still tend to refer to 'the elderly' and 'the disabled', as if they form distinct groups outside the mainstream of society, there is a growing trend to recognise age and disability as something we will all experience, and therefore part of a normal lifecourse. Disabled people have become increasingly assertive about their rights to access buildings and services, while for older people the emphasis is now on independence. Both groups aspire to active participation within the mainstream of society, reject the dependency and institutionalisation that were the norm for much of the last century, and are beginning to assert themselves as consumers who control significant amounts of disposable income. Such new expectations offer a rationale for design that is 'inclusive' rather than exclusive, and more closely aligned to contemporary social expectations.

These changing attitudes and political and economic aspirations have been accompanied by legislation and regulations that have created a framework for a more inclusive society, and triggered shifts in design practice, moving away from special solutions and assistive devices towards increasing accessibility and inclusivity in mainstream design. Underlying these changes is a growing realisation that disability arises not within the individual, due to impaired capability, but is a result of environments, products and services that fail to take into account the needs and capabilities of all potential users. If people can be disabled and excluded by design, they can also be enabled and included by thoughtful, user-aware design.

## **Civil rights and the inclusive society**

Many factors have driven this shift in attitudes and expectations, varying from country to country, and reflecting historic and cultural differences. In the UK, at the end of the Second World War, the sacrifices made by so many soldiers and the hardships suffered by the population in general triggered expectations of social and political justice that led to the establishment of the Welfare State. Across mainland Europe there was a strong desire for a lasting peace and an end to destructive political conflicts and divisions, which triggered the process of unification. Both developments expressed a new sense of shared responsibility, with the focus on the individual as part of a more caring community. More recently, the reality of European union and expansion has brought



with it an emphasis on embracing diversity of culture and ability with the goal of reducing conflict and maximising the economic contribution of all groups within society.

In the USA, a strong civil rights movement grew up, stimulated in part by the sense that black soldiers had died in service of their country and 'freedom' and that they and their families should enjoy the same rights and respect as their white comrades. A watershed US Supreme Court Decision of 1954 established the precedent that 'separate is not equal', and spurred a campaign for educational equality and broader civil liberties for black Americans which provided a model for the disability movement. The Vietnam War was another key factor, since a high proportion of wounded survived, due to the rapid evacuation of casualties by helicopter. As a result, there was a significant swelling in the numbers of young disabled people, and in particular wheelchair users, who found themselves in a world that was not at all disability-friendly. The success of the civil rights movement acted as a stimulus to an equally militant disability rights movement challenging discrimination and championing the aspirations of disabled people. Customized racing wheelchairs, the Paralympics movement and the world's first significant anti-disability discrimination legislation all owe their origins or were deeply influenced by the alliances formed between civil rights activists and ex-combatants.

The assertion of access as a right led to a gradient of expectation, beginning with the demand for a 'barrier-free' environment in which disabled, and primarily wheelchair users would be able to enjoy freedom of movement, and culminating in the concept of 'universal access' to goods, services and environments. The universal design movement was born of this aspirational trend, and should be understood in that context, as a consumer demand that all designs should be universally accessible and useable. There are clearly limitations on how far this aspiration can be met in practice, but the thrust of developments in the US is towards the assertion of individual consumer rights, with the onus being placed ultimately on the provider, supplier or designer to justify why their product, service or environment falls short of the ideal.

In the UK there has been a parallel development of the concept of 'inclusive design', led by both the design and disability communities. The focus here is on encouraging and supporting businesses in a

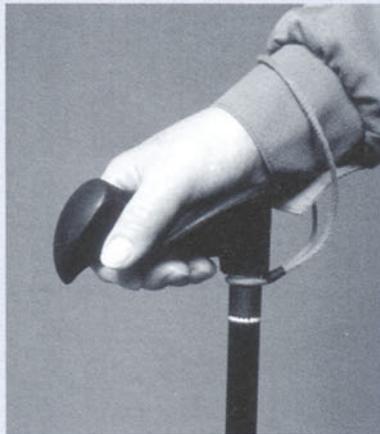
rapidly changing market place to respond to needs highlighted by social and demographic change. In this context, inclusive design is seen as a progressive, goal-orientated process – an aspect of business strategy and design practice – rather than a genre of design or a performance measure.

A more recent factor has been the growing awareness of population ageing and concern about its potential impact on dependency ratios, and hence on healthcare and welfare services, and on state pensions. This has spurred initiatives aimed at increasing independence in later life, and encouraging active social participation. At the same time, the growth in the number of older people is leading to more assertive campaigning groups and significant associations of older people. In the US the magazine of the American Association of Retired Persons (AARP) enjoys a larger circulation than Readers Digest, while in the UK, the University of the Third Age (U3A) has member groups in over 200 towns and cities across the country. As a consequence of these trends, major companies are now looking to the older consumer as a key market sector.

## **Design and social issues**

It is against this backdrop of population ageing and emerging demands for social justice that we need to see the evolution of more recent thinking about the way we design our cities, houses, transport systems, products and services, and how that impacts on the people who use them. The Measure of Man, published in 1959 by American industrial designer Henry Dreyfus, was the acknowledged starting point for human factors in design (Dreyfus, 1959). It established the study of anthropometrics as an essential tool for designers, calculated average types and supported the mass production doctrine ‘one size fits all’.

However, it is now apparent that the ‘universal types’ of much 20th century design failed those on the margins of society – especially as assumptions about what is ‘average’ or ‘normal’ have been too often based on the stereotype of the young, fit, white, affluent male. At the same time, design for those at the margins, essentially older and disabled people, tended to focus on ‘special need’, rather than lifestyle aspirations, and so remained trapped in equally narrow markets where turnover and profitability are too low to justify adequate investment in



Walking stick handle: Ergonomi Design Gruppen.

design itself, giving rise to a plethora of stigmatising and poor quality aids and adaptations.

Nevertheless, over the past twenty-five years or more, ideas have been developing around the desirability for products, services and environments to better match the needs of those previously excluded or denied access by inappropriate design. Designers, from a variety of disciplines, have been instrumental in developing these ideas, which have evolved differently depending on local and individual circumstances. For example, in 1963, UK architect Selwyn Goldsmith published the first comprehensive set of building guidelines on the subject of *Designing for the disabled* (Goldsmith, 1963), while in the US the work of designer Ron Mace led to the concept of universal design (Ostroff and Prieser, 2001) which was further advanced through the Adaptive Environments Centre, Boston, founded in 1978 by Elaine Ostroff and Cora Beth Abel.

The research of designer Patricia Moore, who between 1979 and 1982, toured America disguised as an old woman raised the profile of age discrimination and related design issues (Moore, 1985). These ideas have been influential in Japan, Australia and elsewhere. In Europe, a range of initiatives has been supported by the European Commission and national research funding bodies, while pioneering work has been carried out in by Maria Benktzon and Sven-Eric Juhlins of Swedish design consultancy, Ergonomi Design Gruppen (Benktzon, 1993). Their work was in part inspired by the writings and teaching of American designer Victor Papanek, one of the first people to flag up social issues in the design world. In 1976, Papanek and other leading practitioners from around the world gathered in London at the Royal College of Art, for a conference on 'Design for Need', which explored social aspects of design, including the idea of 'designing out disability', which presaged modern thinking on the subject (Brignell and McQuiston, 1977).

### **Legislative push**

A major driver for change has been the militancy and determination of organisations and individuals pressing the case for equal rights for disabled people, and more recently for older people. The legitimacy of these developments was first established by the United Nations Declaration of Human Rights (1948), but until recently progress has been slow, and there is still a long way to go before we will see a world

where accessibility and inclusion are fully recognised and supported by international standards and levels of provision.

In the United States, an important first step was taken by Tim Nugent – Director of Rehabilitation Services on the Champaign-Urbana campus of the University of Illinois – who recognised in the early 1950s that architectural barriers stood in the way of his disabled students (Goldsmith, 2001). His pioneering work led to the concept of 'Barrier-Free' architecture, and was instrumental in the creation of ANSI A117.1 'Standard Specifications for Making Buildings and Facilities Accessible to, and usable by, the Physically Handicapped' (American National Standards Institute, 1961). This led to the recognition of the need to remove architectural barriers, which was enshrined in the 1981 Architectural Barriers Act, a federal law referencing ANSI A117. This legislation, and the ANSI standard it embodied were highly influential in the United States, leading to later federal laws including Sec. 504 of the Rehabilitation Act of 1973, the Fair Housing Amendments Act of 1988, and eventually the Accessibility Guidelines enshrined within the Americans with Disabilities Act of 1990 (ADA).

This progress was not achieved without significant campaigning by disability rights groups, which built on the successes of the civil rights movement, and in particular the Civil Rights Act of 1964. This legislation provided a building block for Section 504 of the 1973 Rehabilitation Act, which established new legal definitions of disability, and for the first time gave disabled people access as of right to employment, education, buildings and social participation 'under any programme or activity receiving federal financial assistance'. It took a further four years of campaigning and protest, culminating in a 25 day sit-in at the San Francisco office of the US Department of Health and Welfare, before the regulations giving guidance on the implementation of the act were signed on 28 April 1977 (Ostroff, 2001). This was a significant victory for the increasingly militant disability rights movement, and shaped the way the issue was perceived and addressed in the US. Although Section 504 itself was limited to organisations receiving federal funding, it led ultimately to the establishment of the 1990 Americans with Disabilities Act (ADA).

The ADA was the result of a national coalition of disabled people representing all key groups, along with their families and carers, and gave a high profile to disabled people in the US. It also focused

**Progress was not achieved without significant campaigning by disability rights groups**

**This convergence of the two issues of disability and ageing ... has underpinned the dramatic shift in thinking that has taken place over the past 50 years**

attention on the significance of legislation as a driver for changes to the design of the built world. Further legislative initiatives have since pushed beyond the built environment to include telecommunications and products, in particular, the Telecommunications Act of 1996, and Section 508 of the 1998 Amendments to the 1973 Rehabilitation Act (Follette-Story and Mueller, 2001). The Telecommunications Act extends universal access to communications for people with hearing, speech and vision disabilities, and has had a powerful impact on the development of the World-Wide Web and computing software. Engineer Greg Vanderheiden, cofounder of the Trace Center at the university of Madison, Wisconsin (1972), has been highly influential in this field, introducing the concept of 'electronic curb cuts' to describe software and IT implementations that promote accessibility. In 1986 he worked with Alan Brightman on integrating accessibility into Apple computer products (Ostroff, 2001), and in 1996, the Trace Center conducted research which identified the power of legislation in incentivising companies to adopt inclusive practices. (Trace Center, 1999)

Section 508, has been equally influential in that it requires that suppliers of information technology to the federal government make their products usable by people with disabilities. This places a legally enforceable obligation on government purchasers, who command a highly significant proportion of US IT spend. This obligation, whereby the purchaser must choose an accessible product even if it costs more than a technically equivalent but less accessible competitor, in turn stimulates competition between suppliers on the basis of accessibility.

In the UK, architect Selwyn Goldsmith was a seminal figure. As a wheelchair user, he had an early appreciation of the realities of inappropriate design of buildings. In 1963 his book 'Designing for the Disabled' was published by the Royal Institute of British Architects, and set a practical standard in designing for accessibility, primarily based on wheelchair users, which later underpinned the 1967 British Standard Code of Practice CP96, on Access for the Disabled to Buildings. This was revised in 1979 as BS 5810, and in 1987, augmented by Part M of the UK Building Regulations which sets out statutory requirements for accessibility in new buildings.

On the world stage, although the UN Declaration of Human Rights was made in 1948, the first UN conference on the subject did not take place until 1967, followed later in that year by the UN

Declaration and subsequent Convention on the Elimination of All Forms of Discrimination Against Women. However, disability and age discrimination remained in the wings until 1982 was designated UN Year for Disabled Persons. One outcome of this was the adoption of a World Plan of Action Concerning Disabled Persons at the 37th session of the General Assembly in 1982. By 1988 concern was widespread as to the lack of effectiveness of the World Plan of Action. Consequently, Swedish and Italian delegates to the UN Commission for Social Development pressed for an international human rights convention for disabled people, and in 1993 the UN Standard Rules for the Equalization of Opportunity for Persons with Disabilities were adopted, setting out the basic rights of disabled people to access and participation (Sará-Serrano and Mathiason, 2001). In 1999, similar moves to focus on the rights and needs of older people were cemented in the form of a UN Year of Older Persons; a move that had been made six years earlier in Europe, reflecting the rapid ageing of European societies, and will be further reinforced as a result of the 2002 EU directive on age discrimination, and subsequent legislation in member countries.

This convergence of the two issues of disability and ageing, and the shift in focus from welfare and healthcare provision to human and civil rights has underpinned the dramatic shift in thinking that has taken place over the past 50 years. At a political level it has resulted in powerful legislation being enacted in the United States, and in the UK in the form of the 1995 Disability Discrimination Act, which comes fully into force in 2004, when disabled people will have a legally enforceable right to access buildings and services. Australia has been particularly progressive in this regard, with the 1991 Disability Discrimination Act, the 1995 Australian Adaptable Housing Standard (AS 4299), and the Sydney Olympic Stadium and Village as a model of accessibility. Elsewhere, standards and guidance for accessibility, along with legislation establishing and protecting the civil rights of disabled and older people, increasingly support efforts to integrate them into the mainstream of society and promote social participation as of right (see chapter 18, The Japanese experience). The net result of these developments is a raising of expectations about the design of environments, products and services that both public and private sector will have to respond to in practical and positive ways.

Despite the increasing profile of these issues, difficulties remain with the interpretation of legal requirements, and a lack of consistency between standards, in particular at the international level. There is concern that inappropriately phrased legislation could lead to disabled and older people being treated as separate or special groups, rather than promote integration, while a 'deemed to satisfy' approach to standards and guidelines could result in recommended minimum provision becoming the maximum in practice. For example, in the UK, fully 'accessible' toilets in public places are often only accessible to those carrying the 'national key' that unlocks special toilets at railway stations and public venues (Goldsmith, 2001). This has two repercussions: first it reinforces the stigmatising idea that disabled people are somehow different, and second it makes facilities that would benefit many other people inaccessible to them, for example those suffering from temporary disability through accidental injury, mothers with children, and older people who have difficulty using stairs to access 'regular' toilets, etc.

Clearly it is important that as legislation and standards become more widespread and uniform they advance inclusivity rather than special provision, as is the case with section 508 of the US Rehabilitation Act 1998. There is reason to believe that companies will welcome moves to set requirements for accessibility, where these create level playing fields within which companies can compete in delivering accessible goods and services, with the confidence that success will be rewarded through increased sales. (Trace Center, 1999)

### Design responses

As more progressive designers began to grapple with the reality of population ageing and the failure of mainstream design to address the issue of disability, they saw the need for fresh thinking about design – new approaches to the subject, new strategies for practice, and new research methods that could help designers better understand and respond to the needs of an increasingly diverse range of users. These developments took place alongside a growing interest in user-centred design, and a realisation that interface design would become increasingly important in a world of intelligent products and environments. As a result, the emphasis in mainstream product development began to shift away from the harder, technical and

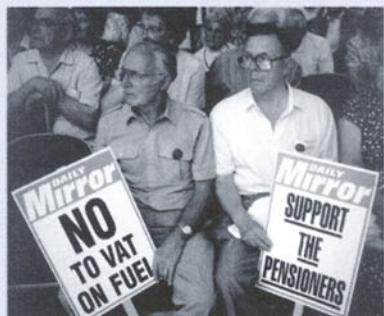


functional performance factors, towards the softer, more human aspects of emotional engagement, lifestyle and aspirations.

In the face of such trends it became clear that designing specifically for disability and ageing could create more problems than it solved through an over-attention to capability deficits and therefore a reinforcement of the medical model as opposed to the social model of age and disability (see chapter 3, *Lifestyle, design and disability*). This recognition prompted a similar shift away from a technical, problem-solving emphasis on design 'for disability', which placed it firmly in the margins of design practice, towards more inclusive approaches that focus on the softer, destigmatising aspects of designs that promote social integration. A rethinking that opens up the possibility of addressing issues of ageing and disability within the mainstream of design.

Just as the legislative push has moved beyond removing physical barriers, towards delivering access as a universal right, so assertive campaigning by NGOs and other representative groups has repositioned older and disabled people as valuable consumer groups rather than welfare recipients. This in turn has stimulated a growing interest on the part of business and industry, all of which is beginning to create a climate in which inclusivity is likely to become a central aspect of business practice and management, along with quality assurance and equal opportunities. Importantly, inclusivity is something that can be delivered through appropriate design and design management, and the new approaches, strategies and research methods emerging within the design community should be seen with this potential in mind.

What follows is a swift introduction to some of the new approaches, strategies and research methods that have and are being developed within the design community. Many of these are dealt with at length elsewhere in this book, and many have been overlooked because space does not allow. However, the sheer scope and scale of these very interesting and novel expansions of design thinking and practice, is enough, we hope, to convince the reader of the significance of the transformation that is taking place in design practice in response to the social trends of population ageing and the move towards an inclusive, consumer society.



**A key aspect of the inclusive approach is to expand the target group of a product or service to include as many users as possible, without compromising the business goals of profit and customer satisfaction**

## **Philosophical and educational approaches**

In Europe the focus has been on social inclusion, in the US on individual rights, and these drivers have resulted in a range of philosophic, academic and practical approaches, ranging from 'universal design' in the US, and its European counterpart, 'design for all', to initiatives that have responded more directly to population ageing. For example, the new discipline of Gerontechnology, that has emerged from collaborations between European and North American academics, and the practice and education-based programmes supported by the Helen Hamlyn Foundation in the UK.

## **Inclusive design**

The European approaches of design for all and gerontechnology are discussed at some length in the chapter 'A European perspective', as is inclusive design, the subject of this book. Inclusive design has emerged in the UK and other countries (Coleman, 1994) from collaborations between industry, designers, researchers and educators. It constitutes a framework and growing body of practice within which business decision-makers and design practitioners can understand and respond to the needs of diverse users, with the ultimate aspiration of developing products and services that can meet the needs of the whole population within the context of a consumer society.

It is important to stress here that what is being attempted through this book, and the research it reports on, is to frame an inclusive approach to design as a reflection of some of the best thinking and practice from around the world, allied to significant information about user needs and capabilities. And to do so in such a way as to present a rationale to support more inclusive business decision making and design practice. A key aspect of the inclusive approach is to expand the target group of a product or service to include as many users as possible, without compromising the business goals of profit and customer satisfaction. The focus is not on age or disability, although these are very important issues, but on inclusivity at a social level, and achieving that through a range of products and services that together accommodate the whole population without stigma.

An emerging concept has been that of 'countering design exclusion', which is particularly powerful because identifying why

and how end-users cannot access or readily use a product or service enables us to take steps to counter such exclusion. This is an extremely important concept. While it is useful to know who and how many can use a particular product or service, that information will not provide guidance on how to include more. However, knowing who and how many cannot use the product immediately highlights aspects of the product that need to be improved. For example, if a product excludes a significant proportion of the population because of perceptual demands, this implies that users cannot hear or see the output from the product necessary to interact successfully with it.

Many of the existing approaches to inclusive design and design for all are focused on making products and services more accessible by extending the initial concept of the end user to include a wider range of users. While this is an excellent starting point, the success of the resultant design is highly dependent on the choice of the end user at the outset. If the end user is very specific, then the needs of that group should be well catered for. However, the overall ability of the final product or service to meet the needs of other end users may be compromised if the design is tailored too closely to the needs of the specified group.

The underlying principle of design exclusion is that by identifying the capability demands placed upon the user by the features of the product or service, it is possible to establish the end users who cannot use it, irrespective of the cause of their functional impairment. Consequently, by re-designing the product or service to lessen the capability demand, a wide range of end user groups can potentially be included and no one is excluded unnecessarily by considering one design aspect to the detriment of others.

Another important concept is 'design for ability'. The key factor here is to recognise disabled and older people as important consumer groups that are currently under provided for, due to the inappropriate capability demands of mainstream products and services. As the major groups suffering the consequences of design exclusion, it is important to gain a better understanding of their lifestyle needs and aspirations, as part of any business or design strategy aimed at countering design exclusion.

Thus inclusive design sets out to influence both business leaders and designers to adopt appropriate strategies and acquire the specialist

knowledge necessary to implement those strategies. Hence there is an emphasis on the provision of design tools and techniques to encourage such participation. Particular attention is being placed on appropriate user involvement in design and the provision of design assessment tools. Both these approaches are putting the focus of inclusive design firmly on understanding the 'user'. This is a shift that looks set to continue in the UK, led by the Helen Hamlyn Research Centre at the Royal College of Art, and the Engineering Design Centre at the University of Cambridge.

### Universal design

In the United States, although there is still a debate about whether the focus should be on accessibility or broader issues, the key development has been that of universal design, as promoted by Ron Mace from 1985 onwards, and is the subject of a comprehensive handbook (Ostroff and Prieser, 2001). Like inclusive design, the intention behind his coining of the term 'universal' was to promote an approach to design that understands and respects the needs of a diverse range of users. Ron Mace, who unfortunately died in June 1998, was an architect, product designer and educationalist. He was also a wheelchair user and, like Selwyn Goldsmith in the UK, used the insight this gave him as a springboard for a professional life dedicated to changing people's perception of design. He was a key figure in promoting the interests of disabled people, and in 1989 established the Center for Accessible Housing at the College of Design at North Carolina State University – later renamed the Center for universal design. Mace's dedication and example inspired a growing movement in the United States. As has been pointed out above, the major thrust of legislation and campaigning has been around access to the built and in particular the public environment.

What Mace realised was that this was just a beginning, and that accessibility and equal opportunities depend not simply on wheelchair access – ramps, turning spaces and accessible toilet facilities – but on the detail of all our interactions with the designed world. The concept of accessibility had therefore to be expanded to apply to the design of products and services, and the way in which people interact with them. His instinct was that the debate needed to shift beyond accessibility – which continues to be perceived in terms of adapting buildings or

products to disabled users – and towards designs that are usable by people of all ages and abilities, and therefore more universal. This also implies that mainstream design should become universal design thereby obviating the need for 'special' products for older or disabled people. It should not be possible to ask: 'Do you want the universal design or the regular design?', and everything should work for the greatest number of people possible.

Between 1995 and 1997, the Center for Universal Design developed, evaluated and refined a set of principles or criteria against which designs could be judged, along with a set of guidelines for the design community. Universal design was defined as: the design of products and environments to be usable by all people, to the greatest extent possible, without adaptation or specialised design. The seven principles, along with the guidelines on the Centre's website have more recently been supported by a CD-Rom of case study exemplars and a listing of performance measures for products.

### **The seven principles are:**

- 1 Equitable use – the design is useful and marketable to people with diverse abilities.
- 2 Flexibility in use – the design accommodates a wide range of individual preferences and abilities.
- 3 Simple and intuitive to use – use of the design is easy to understand, regardless of the user's experience, knowledge, language skill or current concentration level.
- 4 Perceptible information – the design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
- 5 Tolerance for error – the design minimises hazards and the adverse consequences of accidental or unintended actions.
- 6 Low physical effort – the design can be used efficiently and effectively with a minimum of fatigue.
- 7 Size and space for approach and use – appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture or mobility.



Ron Mace: champion of universal design.

## New design for old

In the UK, the Helen Hamlyn Foundation (HHF), which was established in 1984, and is dedicated to improving the life quality of older people, has initiated a range of projects aimed at raising the profile of older people within the design community and encouraging industry to respond to population ageing with innovative, well designed products and services.

In 1986, the HHF organised and sponsored an exhibition, 'New design for old', at the Design Museum in London (Manley, 1986), which brought together some of the finest design talent in Europe. The brief was to develop a collection of new designs for older people, forward-looking concepts that would challenge the commercial world to recognize an increasingly significant market for age-friendly products with a universal appeal. Furniture, clothing, consumer-durables, bathroom and kitchen fittings, door furniture, and personal items showed that products for older people could combine functionality with the appearance and material qualities that made them a pleasure to use and own. New Design for Old was unique in that it demonstrated, for the first time ever, that addressing the needs of older people in the design of everyday items could be a route to innovation, and that the lessons learned from one sector of society could be applied to design as a whole. What emerged was the beginning of a new design approach offering both human and commercial benefits.

On display alongside the professional exhibits were the results of a competition organized as part of the Student Design Awards of the UK Royal Society for the Encouragement of Arts, Manufactures & Commerce (RSA). Sponsored by the HHF and other bodies, this section of the competition has encouraged hundreds of students to work each year on the brief as part of their degree courses. In all the competition has attracted in excess of 1,000 entries, with winning designs ranging from consumer products to interior designs and inter-generational games.

The exhibition was followed by a long-standing collaboration between the Foundation and the Royal College of Art began in 1991 with the establishment of an action-research programme, DesignAge, exploring the implications for design of ageing populations. DesignAge developed as a cross-disciplinary activity engaging with postgraduate



Folding steps: Vico Magistretti and Dinah Casson, New Design for Old.



Bread knife: Ergonomi Design Gruppen, New Design for Old.

students from fashion and textiles to vehicle design, and from photography to industrial design and engineering. .

### **Practice-based strategies**

At the level of design practice, responses have been developed (Coleman, 1993) which set out to bridge between the needs of different groups of users: disabled and able bodied people in the case of 'design for a broader average', as practiced by Maria Benktzon and Sven-Erich Juhlins and colleagues at EDG in Sweden; and young people and older people in the case of 'transgenerational design', as developed by Professor Pirkle at The University of Syracuse in the US. These strategies are all based on a mixture of practical guidelines, methods and conceptual models that can be applied as part of the design process. Individual designers and researchers have also fleshed out practical strategies that reflect more personal responses and professional interests, such as designer Alan Tye's concept of 'healthy industrial design', and Dr. Jonathan Fisk's recommendations for 'design to counter decline'. Together they constitute a growing body of practice and design exemplars that are helping to flesh out the picture of what a more inclusive world will look like.

### **Design for a broader average**

In the past there has been a tendency to associate age and disability with deficit, decline and incompetence. Products that result from this thinking tend to treat age and disability as problems of a medical nature, reflect the vernacular of hospital equipment and are frequently rejected by those for whom they are prescribed as stigmatising and lowering of self esteem. This is not a true reflection of the nature of ageing or disability, and a number of commentators have asserted that such products are longer acceptable (e.g. Gardner, Powell and Page 1993; Sandhu 1993; Mandelstam 1997; Mapstone 2000; Feeney Assocs., 2000). Maria Benktzon and Sven-Erich Juhlins have demonstrated, through their work with older users, and in particular arthritis sufferers and those who cannot walk without an aid or some form of assistance, that it is possible to design in ways that include the needs of such groups within the population<sup>4</sup>. The resulting products offer a combination of performance, functionality and aesthetic appeal

that positions them within the mainstream of consumer products rather than as disability aids and equipment. (Benktzon, 1993)

The key strategy in their work is to target designs at the broad mass of the population in terms of cost and appearance, while accommodating those with more restricted capabilities in terms of performance and functionality. This is achieved by applying the concept of 'the pyramid of needs' and results in what they term 'design for a broader average'. The pyramid helps identify groups with capabilities that challenge and extend the interpretation of the design brief, while Benktzon and Juhlins have also developed a range of observational research techniques that allow them to better understand the functional requirements of older and disabled users. These methods have been successfully transferred from specialist areas of cutlery and walking stick handle design, based on the needs of arthritic users, and applied to the design of hand tools, catering equipment for airlines, and ambulance stretchers. The resulting designs have set the highest standards in user-friendliness and established ergonomic benchmarks in the design of tools and equipment. Further examples of their work are featured in chapter 17 'A European perspective'.

### Transgenerational design

Professor James Pirkl and colleagues at the University of Syracuse, have argued that product design has persistently ignored the needs of older people and created an environment that is inappropriate and inconsiderate of a substantial sector of the population. In response to this they have developed the concept of 'transgenerational design' (Pirkl, 1991) to describe products, services and environments that meet the needs of people from a wide range of age groups and with differing needs and abilities. They have also evolved a series of guidelines and strategies for applying this concept, and similar methods for approaching journalism, advertising, retailing, employment policy and marketing. (Pirkl and Babic, 1988)

This concept is best summarised in Pirkl's own words: "... how can we best accommodate the needs of the ageing segment of our transgenerational population? Options include:

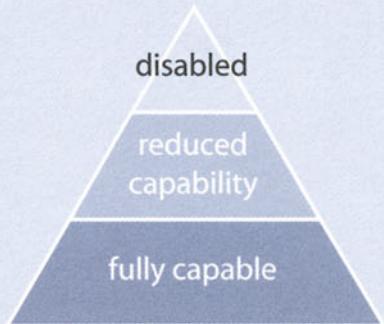
- Do nothing. This will perpetuate the problem.

- Develop specialised elderly products. Such products will immediately become stigmatised, however, and be rejected by the very market for which they were intended.
- Design products at the outset for use by a transgenerational population – including the aged as well as the young and able-bodied. Fortunately, I believe this last option to be the greatest benefit to the aged while at the same time offering a better product to younger generations. I see no reason why a fire extinguisher or a faucet control should not be as usable by a septuagenarian as by a teenager.”

Transgenerational design is framed as a market-aware response to population ageing and the need for products and environments that can be used by both young and old people living and working in the same environment. Pirkle's book on the subject (Pirkle, 1993) outlines a practical strategies in response to population ageing, along with case study examples based on applying a better understanding of age-related capabilities in tandem with a recognition of the needs and preferences of younger people, in particular where they live in the same house, share the same facilities or use the same products. For example, older people are now far more active than previous generations (Allied Dunbar, 1992; Scales and Scase, 2000). Sporting activities, exercise and fitness classes feature as part of the new lifestyles of older people who are not only healthier, but more experimental than before. For that vision of a dynamic, participatory later life to be realised much will depend on whether or not sports and leisure facilities are designed to appeal to both young and old, and allow them to participate in such activities together.

## Healthy industrial design

Healthy industrial design (HID™) is a concept developed in the UK by Alan Tye RDI. In response to growing awareness of some of the problems associated with the use of products and environments, e.g. repetitive strain injury, he has developed a strategy which draws on insights gained from a range of body-mind techniques and applied these to the design of products and environments. The intention is to enhance the health and enjoyment of the user through appropriate rather than excessive movement. Although the details of this method are not published for commercial reasons and because Tye believes



The pyramid of needs: Maria Benkzon and Sven Erich Juhlins, Ergonomi Design Gruppen, Sweden.

they must be learned through practice, he has applied similar thinking to designing for older people, for example, a range of self-luminous door furniture which is intended to help older people locate handles, keyholes and light switches in the dark. Tye emphasises the importance of not designing 'special' products for elderly people. 'Elderly people are not disabled. A shoe or saucepan designed for the disabled foot or hand is unlikely to suit an elderly foot or hand (Tye, 1993). Provided elderly people are considered at the right stage, all products should be suitable for young and old.

### Design to counter decline

Alan Tye's concept of designing in ways that enhance the health and well-being of the user is echoed in a thesis put forward by Jonathan Fisk, a designer and NHS doctor, who argues that design for rehabilitation could be differently oriented as 'design to counter decline' and actively encourage individuals to regain previous skills (Fisk, 1993). This is a reversal of the medical convention whereby disability is seen as a consequence of age and impairment that requires specialised designs and adaptations, which asserts that instead, 'a properly designed intervention, at any age, may reduce the impairment of adulthood and old age substantially'. Fisk applied these principles within the context of a rigorous design method that resulted in a kettle, The Duet, which was awarded joint first prize in the Age Concern Coming of Age design competition in 1991. The key considerations in the design were the avoidance of accidents through scalding, improved grip (especially for arthritics), light weight, balance and user-friendliness leading to increased self-sufficiency.

### User research methods

A growing interest in how people interact with products and services, especially in terms of emotional engagement, combined with a awareness of the breadth of individual capabilities across the lifecourse and the cultural diversity of modern communities, has obliged designers to rethink assumptions about who their typical consumer is likely to be. One thing that is very clear is that the temptation to design for themselves, that typifies much student work, and indeed the work of some of leading designers, is not appropriate in the modern context. Unfortunately, understanding and responding to user needs



Duet kettle proposal: Jonathan Fisk.

is regarded by many designers as an unwelcome curb on creativity, rather than a spur to innovation. It was with this misconception in mind that the DesignAge programme at the Royal College of Art in London, developed the idea of 'designing for our future selves' as a way of encouraging young students to think about and empathise with older users in the spirit of creating a future world which they themselves might enjoy when older. In the process a range of user research methods have been established on the basis of bringing older and disabled people into the college to work with students (Coleman, 1997a). The result has been a growing body of inclusive design exemplars, ranging from tools and guidance to help airport designers create environments that are easy to understand and navigate, to clothing for wheelchair users, and lightweight power tools for a major high street retailer.

Leading international consultancies, such as IDEO, Smart Design, and EDG; individual designers like Patricia Moore; research institutes such as HUSAT, now part of Loughborough University; and leading design schools, in particular the RCA and Domus Academy of Milan, have all originated their own user research methods to help them better understand and gain insight into the needs and aspirations of an increasingly diverse range of users. Although many of these techniques originally focused in on older and disabled people, the best of them can be just as effectively applied to other consumer groups. Others, that were developed to tap into specific aspects of consumer behaviour and preference, can be effectively utilised in understanding older and disabled people.

What is interesting about this growing body of user research methodologies is that many are readily transferable from specific groups to the population at large. As a whole, they demonstrate the richness of research that is an integral part of the design process. Increasingly, these research methods are being taken up by researchers from other disciplines and valued for the sort of information to which they give access. As designers and academic researchers increasingly work together, both on research council funded programmes and in commercial contexts, there will be scope for interesting cross-fertilisation between these previously separate worlds. The potential value of such developments is demonstrated by the growth of user



Patricia Moore as an old woman.



The Third Age Suit.

research groups within the larger design consultancies, such as Smart and IDEO, and the way in which user research is being integrated into everyday design practice.

### Through other eyes

Perhaps the first substantial piece of user research to address the implications of population ageing was carried out by designer Patricia Moore, when employed at Raymond Loewy's famous NY offices. During her 20s, she spent 3 years (1979-82) travelling throughout US and Canada disguised as an 85 year old woman, visiting over 200 cities and experiencing life through the eyes of an old woman (Moore, 1985). To achieve this she not only dressed as an old woman, she also restricted her joints, her hearing, her vision and so on, and the discoveries that she made shaped her thinking about design and were influential on the growing universal design movement in America.

This remarkable experiment (described at length in chapter 28, Design and Empathy) along with subsequent publications and broadcasts on the subject triggered a range of simulation and immersive studies and methodologies, aimed at giving designers and business decision makers some insight into the challenges faced by older and disabled people. A training programme 'Through Other Eyes' was developed in Canada, and later taken up in other countries, including the UK, and has proved influential in business management and in particular in relation to the response to anti-discrimination legislation. In ways that parallel Moore's experiment, business managers wear restrictive devices that alter their hearing sight and mobility, and then experience the products, services and environments on offer from their own companies. The impact of these programmes can be significant, and prompt radical changes in design and business practice.

Moore's experiment has also triggered the development of 'age suits' in the UK, Germany, and other countries, that are used in training and product development programmes. In particular in the automotive industry, where companies like Ford and Fiat have taken a serious interest in the subject, triggered by an awareness of population ageing and the relative seniority of the average new car purchaser, as discussed in chapters 13 and 19, 'The Fiat Autonomy Programme, and 'Universal products in the US'.

## Design by story-telling

The international design company IDEO has worked on a number of products which address older markets, for instance a remote hearing aid controller designed like a pen for ReSound, an eyedropper for Clement Clarke and an emergency call unit for Nynex, others of which are discussed elsewhere in this book. The company is known for its innovative approach both to design and to the use of the latest technology in achieving user-friendly solutions to practical problems. A key to its success lies in the effective use the company makes of a multi-stage design process, based on scenario building or story telling, which has evolved over the past ten years into an extensive methodology (Moggridge 1993; Coleman, 1997a). By setting themselves to first understand and observe the potential user, and then visualise scenarios around a range of users they can both identify new product opportunities and ensure that the widest possible range of users are considered in the final design (see also chapter 11, Connecting business, inclusion and design). Perhaps not as radical as Patricia Moore's experiments, this technique has proved a very powerful and innovative tool in the product development process and insights gained from its use can later be evaluated in user tests prior to implementation.

## The Methods Lab and Userfit

IDEO and the Helen Hamlyn Research Centre have both worked on gathering and categorising a range of user-research methodologies for designers, which have been published under the title of 'The Methods Lab' (Coleman, Bound and Aldersey-Williams, 1999; Coleman 1999). Contributions to this publication have also come from Domus Academy in Milan, Interaction Design at the RCA and other collaborators in an EU-funded research programme, PRESENCE, which explored inclusive and age-friendly applications for new and emerging information technologies. Both IDEO and the HHRC have extended this work in their own ways and formats, and some of which is discussed in chapter 29, A designer-centred approach. The European union also funded work on user-research methods at HUSAT, now part of the University of Loughborough, which resulted in an extensive methodology for rehabilitation design much of which can be readily applied to mainstream design practice, especially where the object is to identify needs and capture design requirements from among specific groups



**The important issue is whether or not business and industry rises to the challenge**

for the purpose of developing inclusive solutions. The results have been published in book form under the title of UserFit, and key sections can be accessed via the Internet (TIDE User Consortium).

### Where next?

Delivering an inclusive society requires that a consideration of the needs of older and disabled people, along with other groups marginalised by changing patterns of working and living, and by technological developments, becomes part of the mainstream of design thinking and practice. Progressive designers and researchers are aware of this priority and have collectively developed a powerful collection of strategies and user-research methods in response. As a result there is now a significant and growing body of work – exemplars of inclusive design in action – that is putting flesh on the bones of more theoretical approaches to the subject. What is clear is that the design profession is well prepared to tackle the challenge.

The important issue is whether or not business and industry rises to the challenge. Legislation is an important driver here, and the pace of international recognition and regulation has accelerated significantly in recent years. Companies that respond are likely to profit as a result, but there is still a disappointing lack of urgency among the business community, that smacks of short-term thinking. What is missing from the picture is significant consumer pressure. Although campaigning organisations have achieved significant gains, these have come, in the main, through legislation rather than as a result of consumer demand, and it is here that the next big changes are likely to occur.

Beyond the stick of legislation and the carrot of future profitability, collaborations between designers, consumer organisations and campaigning groups can help develop the exemplars and expose potential consumer demand in ways that industry can understand. A further crucial element is the establishment of the national and international standards that can begin to create the level playing field on which companies can compete with one another to deliver inclusivity through design and business practice. Moves are being made in this direction, some of which are discussed in the final section of this book. Striking a balance between coercion and incentive will be critical in the future, and one of the most important contributions that design

and designers can make is to continue to develop the inspiring and innovative examples that help to focus attention on the human, social and economic benefits of an inclusive society and bring currently marginalised groups into the mainstream of society.

## Acknowledgements

Photo credits: Georgina Ravenscroft, ladies laughing; Center for Universal Design, portrait of Ron Mace; Ivan Coleman, protesting pensioners; Peter Carruthers, sports wheelchair.

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# The business case

# **Understanding consumers**

This section explores one of the most important tasks facing businesses of all kinds – understanding the consumer.

Psychologist Felicia Huppert presents an overview of designing for the older user. Despite the physical and cognitive deteriorations of ageing, she argues that older people should be seen not as disabled but as striving for independence and not in isolation but within extensive social networks.

Her essay is followed by three personal accounts. Marion Bieber of the University of the Third Age offers a wishlist of design improvements from the perspective of an octogenarian. Katy Owen, with Malcolm Johnson, reminds us that disabled people are not an amorphous group – five distinct disabled consumer types are identified. And Judith Payling interviews a disabled couple from Kent about how inclusive thinking can change their lives.

The two final essays in this section adopt broader consumer perspectives. Simeon Keates and John Clarkson of the University of Cambridge introduce the concept of design exclusion and explore the tensions between marketability and inclusivity. David Yelding of the Research Institute for Consumer Affairs sets out the ten most common design failings and calls for a more creative relationship with consumers.

# Chapter 1

## Designing for older users

**Felicia Huppert**  
University of Cambridge



## New ageing

We are living in a unique historical period. Never before could people expect to live so long. Never before have older people formed such a large proportion of the total population. Never before have physical and mental capabilities remained so high into advanced old age. The speed of these changes has been remarkable, and our societal structures, attitudes and policies are struggling to come to grips with the implications of these changes.

The sheer numbers and proportions of older people, together with their spending power, provide a strong business case for designers and manufacturers to cater to older consumers (see chapter 7, Living longer). The need for design change is not limited to consumer products. It should also be a priority for designers involved in the public services. From design of printed matter and communication and information technology, to the design of transport, housing and public buildings, a better understanding of users' needs can dramatically improve the independence and quality of life of the vast number of older users. But for these endeavours to be most effective, we need to go beyond the numbers, to understand the lifestyles of today's older adults, as well as their physical and mental capabilities.

## The changing lifestyles of older adults

A major effect of increased life expectancy is the rise in the number of multi-generational families. It is becoming commonplace for children to have living grandparents and great grandparents. Individuals in their 40s, 50s and 60s have been described as 'the sandwich generation', because they frequently have children and grandchildren to nurture, as well as parents and grandparents to care for. Moreover, as a result of the increasing divorce rate, large numbers of middle-aged and older adults have an extensive range of step-kin with whom they interact. These changes in family structure have profound implications for how older people organise their lives. Most design-oriented research on older consumers tends to focus on older people in isolation, rather than within the context of their extensive kin network with its implications for time use, communication, travel and spending.

There is also enormous variation in the lifestyles of older people, and chronological age is becoming an increasingly unreliable predictor of lifestyle. Large numbers of older people have childcare



responsibilities for their grandchildren, and provide financial support for the younger generation. In contrast, many older people welcome the end of formal work and parenting, and pursue a self-fulfilling and independent lifestyle, congruent with the slogan 'you can't take it with you'.

The changing nature of working life also has a major impact on the way of life of older people. The trend has been for early retirement among men and for the majority of women to be employed, particularly when their children reach school age or leave home. In the future there will be an increase in the length of working life for both men and women, and probably a gradual rather than an abrupt retirement. These changes have profound implications for the design of work-related products and workplace environments in order to retain older workers and ensure their well being (see Czaja, 2001). The influence of events that occurred during the formative years and working lives of different generations of older people should be understood in order to help designers and marketers meet the changing needs and preferences of the 'mature market'.

It is a mistake to think of the older user as a wheelchair user or as severely disabled, hard of hearing or partially sighted. Older users are that vast number of people who, in advancing age have little discernable impairment, but have a strong drive to remain independent and to contribute to the community, but are hampered by inappropriate design. Better design can play a crucial role in enabling older people to remain physically and mentally active (see chapter 2).

So why do designers, manufacturers and advertisers remain obsessed with youth? One important reason is our society's negative stereotypes of ageing and elderly people. This chapter presents some of the relevant facts about ageing and older people today, which challenge these stereotypes. The aim is to show that simple alterations in the design process and its outputs will attract the growing body of older consumers, and result in older people in general leading more fulfilled and independent lives, to the benefit of individuals, families and the society at large.

### Older users are us

If you are over 50, you are classed as an older user. If you are under 50, you are on your way to becoming an older user. So, whatever your

age, awareness of inclusive design and improvements in the design of everyday objects will benefit you. As the brilliant historian and demographer, Peter Laslett urged, we should try to imagine ourselves in the presence of all our future selves (Laslett, 1996). By doing so, we can go some way towards ensuring that the design improvements needed will be implemented in time to benefit us. Some may describe this as enlightened self-interest! Inclusive design holds the key to a better future for all of us.

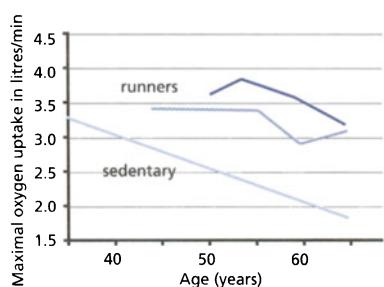
**It is a mistake to think of the older user as a wheelchair user or as severely disabled, hard of hearing or partially sighted**

## The ageing process

Ageing is a process which we all go through from the time we are conceived. In the early years, ageing is about growth and differentiation. We typically reach our physical and sensory peak in our early 20s. While some aspects of our mental ageing also peak at around this time (e.g. memory, speed of information processing), other mental abilities continue to develop throughout most of our adult lives (e.g. vocabulary, general knowledge, emotional control). This chapter and chapter 21, on the prevalence of functional impairment, will provide descriptive information about the abilities of typical individuals in various age groups. But this chapter will go beyond what is typical or average, to emphasise some key points:

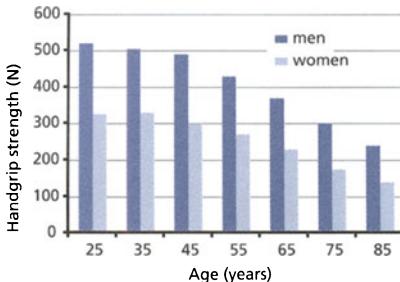
- The differences between individuals of the same age (e.g. 30-year olds) are far greater than the differences between age groups (e.g. the average 30-year old compared with the average 60-year old).
- Our capabilities are related to how actively we use them. Elite athletes who continue to train to older age easily out-perform the average 30-year old (Figure 1.1).
- Elderly people today are fitter and more capable than elderly people in the past.

All three of these facts lead us to challenge the negative stereotypes of ageing. While it is true that many of our capabilities begin to decline from our mid-20s, the rate of change is remarkably variable and some individuals show little or no evidence of decline. Furthermore, our images and expectations of ageing are derived from the way in which individuals aged in the past. A hundred years ago, the average age of death in the UK was 50, and people around this age had numerous



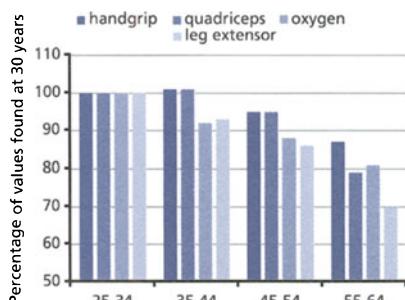
### 1.1 Male runners – oxygen uptake

Data from two longitudinal studies of male runners who attempted to maintain regular activities throughout (based on Bassey, 1997).



### 1.2 Handgrip strength

Change in maximal isometric handgrip strength with age in men and women. Data from two representative national surveys in England (based on Bassey, 1997).



### 1.3 Physical capabilities

Percentage change with age in around 1000 women in the maximal values of four physical capabilities. Data from a representative national survey in England (Allied Dunbar National Fitness Survey, 1992, 1997).

diseases and impairments. Today the average age of death in the UK is around 80, and these diseases and impairments are now rare until advanced old age. So we need to change our beliefs about the capabilities of older people to reflect the enormous improvements which have taken place, and are set to continue.

The next section briefly presents the facts about age-related changes in physical, sensory and mental capabilities, and their implications for inclusive design.

## Physical capabilities

Being able to perform physically at a level which ensures an independent lifestyle requires adequate muscle strength, muscle power, flexibility, balance and cardio-respiratory endurance. These functional abilities are characterised by 'reserve capacity' in the young, but during the ageing process the functional reserve is depleted and impairments appear. However, impairment is not an inevitable consequence of the passage of time. Much of the impairment among older adults is due to restricted levels of physical activity. Research shows that when physical activity increases, so too do physical capabilities, even in extreme old age (e.g. Fiatarone et al., 1994).

Muscle strength (e.g. hand grip, quadriceps strength) is at its peak around age 25 on average, and begins to decline quite sharply from around age 50. Hand strength is needed for lifting and as an adjunct to leg strength when rising from a low chair, getting onto a bus or out of the bath. Figure 1.2 shows a steep decline in hand grip strength for men and women from age 45-54, and for those aged 75+ it is less than half of the value for young adults. However, muscular strength is rarely used without movement, so muscular power (which combines strength and speed) is required in dynamic activities such as climbing stairs, rising from a chair, getting on to a bus or out of a bath. Muscle power (e.g. the extensor power of the leg) tends to decline even more sharply than muscle strength (Figure 1.3).

Flexibility i.e. an adequate range of movement, is essential for many activities. For instance, an adequate range of movement in the shoulder joint is needed for reaching above the head (e.g. to get items down from a high shelf), drawing curtains, hanging out washing, or reaching the back of the neck to fasten clothing or brush hair. Loss of range in the shoulder joint is common in old age. Balance requires a complex

integration of sensory inputs followed speedily by precise motor reactions. For example, restoring equilibrium of the body mass to avoid falling after you have tripped requires rapid powerful movements, and these decline with age, resulting in a greater tendency to fall. Endurance is the capability of sustaining prolonged dynamic activity, and this too decreases with age. If the working muscle does not receive enough oxygen to supply its energy needs, this will lead to fatigue and breathlessness. In these circumstances, individuals slow down or stop for a rest until the oxygen supply to the muscles is increased. Ageing is also accompanied by a loss of elasticity, which as well as its signs on the skin, affects the lungs and the way we walk; walking becomes less efficient because of the loss of rebound energy. In very old age, the combination of joint stiffness and poor balance may become severely limiting as walking speed falls below a safe level for walking outside the home.

In general, physical strength is related to body size, so women are physically weaker than men at all ages. Women's physical capabilities are about two-thirds those of men (see Bassey, 1997). Women have weaker muscles and a poorer power-to-weight ratio. They are therefore at a disadvantage on tasks that have an absolute strength requirement, such as lifting and carrying shopping. Their disadvantage is even greater on weight-bearing activities such as walking and stair climbing. Older women should therefore be a priority target group for inclusive design.

Physical capabilities are also influenced by height and other bodily dimensions. Older people are significantly shorter than younger people, both because there is a large generational influence on height, and because, from mid-adulthood onwards, we begin to lose height. The combined effect is that the average height of someone aged 65-74 is 5cms less than the average height of someone aged 16-24, and this height difference is almost double for those aged 75+ (Health Survey for England, 2000). The design of many household items (e.g. the height of kitchen cupboards, work surfaces and seating heights in public and private places, fails to take these large differences into account. The sight of an elderly woman sitting on a chair with feet dangling is not uncommon. It is not only uncomfortable but also a danger to health, since the restricted blood flow can lead to vascular problems such as deep vein thrombosis (DVT). Other aspects of bodily dimensions also change with advancing age. Feet become broader, and





waistlines thicken as the ratio of body fat to muscle changes. Awareness of such changes is important for the designers and manufacturers of footwear and clothing.

In addition to the normal age-related changes in physiology, physical capabilities are influenced by the variety of health problems which increase with advancing age. One of the most common age-related health problems is arthritis which causes swelling and pain in the joints, and limited movement and weakness in the arms and hands, resulting in poor dexterity. People with arthritis find it difficult to get a firm grip or make fine, precise finger movements. Double actions such as push and twist are particularly difficult for people with poor dexterity.

### Implications for design

- Good design can play a major role in maintaining or increasing physical independence among older adults. Good design can ensure that age-related impairments in physical capabilities are not disabling.
- Designs which impose physical demands which are well within the capability of most older people can play a part in maintaining their physical activity, which in turn reduces physical decline. Designs which largely avoid physical demands (e.g. rely on voice-activation) are valuable for those with severe physical impairment, but may be a disservice to the average older person.
- To be inclusive, design should take account of the physical capabilities of older women, since women have less strength and power at all ages than men, and they comprise the majority of older users.
- Changes in bodily dimensions, including age-related shrinkage in height, need to be considered in the design of everyday objects, including furniture and clothing.
- Where possible and appropriate, heights of products should be adjustable, and tasks should be achievable using one hand rather than two to allow for strength variation between the hands and to allow for balance support while undertaking the task.

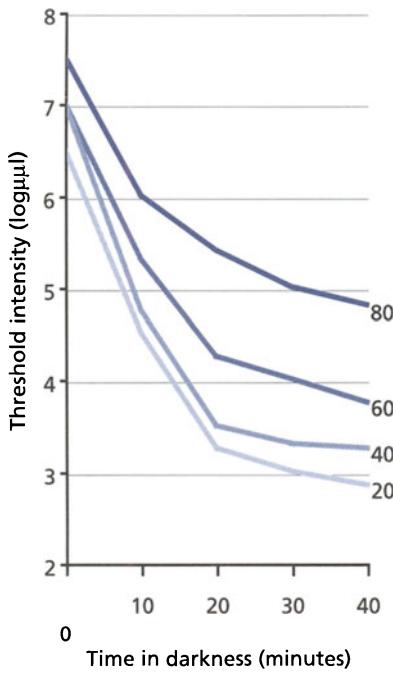
## Sensory capabilities

To obtain information about the world around us, we rely on our five main senses – vision, hearing, taste, smell and touch. Physiological changes occur in all our sense organs as we age, reducing our sensitivity to incoming information. These changes begin in our late teens or early twenties, and although changes are inevitable, it is not inevitable that they will lead to impaired functioning. Functional impairments may be related to disorders which are associated with ageing, rather than to the normal processes of ageing. Some conditions such as cataracts are a common cause of impairment among elderly people, but their effects can be completely reversed following surgery. Some age-related decrements in vision and hearing can be corrected using vision or hearing aids, but others, such as the time taken to adapt to bright light or to darkness, cannot be so corrected (see below).

### Vision

Age-related physiological changes lead to a decline in our ability to see detail, to focus on near objects, to discriminate differences between levels of contrast, adapt to changes in brightness, and manage in extremely bright light, as well as to mild impairments in colour vision and depth perception. The principal physiological changes occur in the lens of the eye which is responsible for focusing light onto the retina, and to the muscles of the eye which control the shape of the lens and the size of the pupil. The lens becomes more opaque and less elastic and also tends to discolour with age. The opacity and discolouration mean that less light enters the eye and an increase in illumination is necessary for older people to see detail. The discolouration of the lens also reduces colour vision, the effect being particularly to filter out blues and violets. The loss of elasticity of the lens in adult life means that it is less able to focus incoming light onto the retina. This results in a change in the optimal viewing distance, which begins to lengthen from 8 cm at around age 10, to 50 cm at age 50, to 100cm at age 60 (Grandjean, 1986). By the age of 50, many people need to wear reading glasses to correct their long-sightedness. The perception of distance and depth is also affected from around age 40, as the ability of the two eyes to converge on an object is reduced due to weakening eye muscles.





#### 1.4 Dark adaptation

Decline in light sensitivity with age. Visual threshold after dark adaptation in different age groups (based on Timiras, 1988).

An increase in illumination can improve our ability to see detail, until a point is reached where the illumination is so great that glare begins to decrease performance. The discomfort and even disability which arises from glare is more disturbing to those over 40 than to the young. Because of the thickening and yellowing of the lens with age, and the reduction in pupil size, it takes longer for older people to become accustomed to seeing in a dark environment after coming from a light environment. The absolute sensitivity of the eye to light (the visual threshold) can be measured after individuals have been adapted to the dark. This is depicted in Figure 1.4 which shows that, even when they have had ample time to adapt to the dark, 60 year olds require ten times as much light (1 unit on the log scale) as 20 year olds to detect that there is a light present, while 80 year olds require 100 times as much light (2 units on the log scale) as 20 year olds to detect that a light is present. This demonstrates how profound are the age-related deficits in light sensitivity. However, under normal conditions of illumination, twice as much light is required at age 40 as at age 20, and three times as much light at age 60.

#### Implications for design

- Lighting levels in homes, inside cars and in public places need to take account of the far higher levels of illumination required by older adults to see objects and details, but harsh or excessive lighting which produces glare should be avoided.
- Visual displays should use appropriate font size and type and adequate word and line spacing.
- Displays should be simple, uncluttered and concise, prioritising important information.
- Clear graphic symbols should be used as an adjunct to words where possible.
- Surfaces should be non-reflective, and brightness and colour contrast high. Blue-violet-green combinations should be avoided.
- Stairs should have clearly marked edges.

#### Hearing

The normal processes of ageing are associated with a reduced sensitivity to sound, particularly high frequencies. Understanding the spoken word is also affected, especially in discriminating between consonants,

since those have very quick transitions compared to vowels which are longer lasting. Any hearing impairment is exacerbated when there is background noise, because of a reduced ability to mask irrelevant sounds. Even a moderate degree of hearing impairment, unless it is corrected, can have a devastating effect on an individual's life, since the ability to communicate with others plays such an important role in human well-being. It is an interesting and sad observation that people in general show less sympathy and more irritation when interacting with someone who is hard of hearing, than with someone who has a visual or other physical impairment. As a result, people who are hard of hearing often show symptoms of depression and may become socially withdrawn. People who are hard of hearing sometimes cope with their difficulty by doing most of the talking, rather than struggling to listen.

There are numerous physiological changes that take place in our auditory system as we age. The eardrum becomes more flaccid as the supporting muscles grow weaker, and this makes it less easily vibrated by sound waves. Sound vibrations are passed through tiny bones to the coil-shaped inner ear, but the joints between the bones calcify and stiffen, causing them to be less easily vibrated. However, the major changes responsible for age-related hearing deficits occur in the inner ear, with the gradual death of the nerve cells that conduct the sound signals to the brain. The first nerve cells to die are those that respond to high frequency signals. This process starts around puberty. By about age 50, there is generally sufficient hearing loss to cause impairment in reasonably demanding listening situations such as detecting faint sounds or in the presence of background noise. Amplification can improve some aspects of hearing, but does not help older adults in understanding speech, detecting high-pitched sounds, or separating selected sounds from background noise.

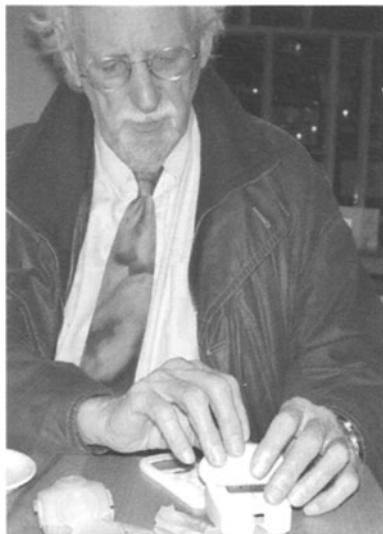
The age at which hearing impairment sets in, and its severity, is related not only to the normal ageing process and genetic susceptibility, but is also profoundly influenced by exposure to environmental noise. Long periods of exposure to very high levels of noise at work (e.g. some construction sites, road works, factory machinery) or to heavily amplified music produce earlier and more severe hearing impairment than would otherwise be the case. The growing popularity of music played at very high levels of amplification does not bode well for the hearing ability of a future generation of older adults.

**The first nerve cells to die are those that respond to high frequency signals. This process starts around puberty**

## Implications for design

- Audible signals should be adjustable where possible, so that both volume and tone can be altered to suit the user.
- A combination of audio and visual signals increases the chance that messages are received.
- Ambient sound produced by the product or environment should be minimized to avoid auditory confusion.
- Lower frequency sounds should be used to convey important messages.

## Taste, smell and touch



Our perception of taste is intimately associated with our sense of smell and our perception of texture. Different regions of the tongue are equipped with different types of taste buds. Beginning at the tip of the tongue and moving back towards the throat, the taste buds respond respectively to sweet, salty, sour, and bitter substances. We experience the tastiness of foods and drinks through the particular interactions between the taste buds which have been stimulated. As we age, we tend to enjoy food less because we lose our taste sensitivity – that is, it takes more molecules of a substance on our tongue for us to recognise the flavour. However, much of the age-related dearth of taste sensitivity appears to be a consequence of reduced sensitivity to smells. This close relationship between taste and smell is clearly seen when our nose is blocked by a cold: food seems to become quite tasteless. Odours go up our nose every time we breathe, and different odorants stimulate different receptors at the back of our nose. The particular combination of receptors determines the smell we experience. There is very little loss in our ability to identify odours up till the age of about 65. Beyond that age, the impairment can be quite marked, affecting appetite regulation and food selection, reducing pleasure from the fragrance of food, flowers and perfume and putting the elderly at risk from the inability to detect dangerous smells, such as decaying foods or leaking gas.

Our experience of touch is a combination of the stimulation of three types of receptors on the skin; pressure, pain and heat/cold. As we age, many of these receptors die off, resulting in changes in our ability to perceive various types of touch. The skin of our hands becomes less sensitive to pressure, and there is a reduction in 2-point discrimination; that is, two points touching the skin need to be further apart for an

older person to recognise that there are two sources of pressure rather than one. This leads to a reduced ability to differentiate between shapes and textures by touch. After age 50, our ability to perceive vibrations is also diminished, particularly if the vibrations are high frequency. In contrast to the substantial age-related changes in sensitivity to pressure, there is little evidence that responsiveness to pain and heat are affected by the ageing process.

### Implications for design

- For elderly people, the appreciation of food is enhanced by attention to its appearance.
- Dangerous smells (e.g. burning, gas leakage) should be signalled where possible by strong messages from several sense modalities.
- Textile and other surfaces should take account of the diminished tactile sensitivity of elderly users.

### Cognitive capabilities

The ability to function independently is as much related to our mental capabilities as to our physical capabilities. The term cognition refers to the set of mental capabilities by which we pay attention to the world around us, interpret the information that comes in from our senses, learn and remember, solve problems and make decisions. While all of these abilities decline to some degree with advancing age, impairment may only be evident when an individual is faced with a situation that is novel, demanding or complex. Mental abilities which are based on bodies of information acquired over long periods of time (e.g. vocabulary, work-related expertise, hobbies and interests) tend to remain stable with advancing age, whereas abilities which require the rapid assimilation and analysis of new information tend to decline quite sharply.

There is a marked age-related decline in the speed at which we can process information (Salthouse, 1991) which leads to difficulties with tasks where information is presented for very brief periods or rapid responses are required. Comprehending fast-paced TV or cinema advertisements and playing high speed computer games are beyond the capabilities of many older adults. Age-related mental slowing parallels the age-related physical slowing which was described above.



**There is a marked ageing effect in dual task situations such as speaking while driving**

The principal physiological change that occurs in the ageing brain is the loss or shrinkage of brain cells in the outer layers of the brain (cerebral cortex) which are responsible for our cognitive abilities. The maximal loss of brain cells occurs around the time of weaning, and there is a gradual decrease thereafter. The connections between brain cells are also reduced with advancing age, but even in old age, learning and new experiences result in the formation of new connections. The saying ‘use it or lose it’ applies as much to the brain as to our muscles (Hultsch et al., 1999).

Most cognitive abilities reach their peak, on average, in our late teens and early 20s, and tend to remain relatively stable until our 50s and 60s, when declines become more apparent. The rate of decline differs between abilities and between individuals. Some abilities such as understanding word meanings, appear to go on increasing into late adulthood, while others, such as numerical ability or any ability which depends on speed of processing, show a steady decline from the mid-20s onwards. At any age, our cognitive ability is influenced by physical disorders, depression, medication, stress levels and amount of sleep, and with advancing age these factors may increase the amount of cognitive impairment. On the other hand, the effects of these factors are often reversible. The prevalence of degenerative brain disorders such as Parkinson’s disease, Alzheimer’s disease and vascular dementia also increase with advancing age. Population studies have shown that about 20% of adults in the UK aged over 80 have some form of dementia (Medical Research Council Cognitive Function and Ageing Study, 1998). On the positive side, this means that 80% of those aged over 80 do not have dementia, and many of these individuals show little evidence of cognitive impairment even in their 90s and beyond.

## Attention and concentration

We are constantly bombarded by masses of information coming in through all our senses. It is impossible to pay attention to all of it, so we must select what we attend to while at the same time monitoring other sources of information so as not to miss important or dangerous signals. The ageing process is associated with impairments in our ability to pay attention to the world around us. On average, our ability to sustain attention and to shift our attention between incoming sources of information decreases as we get older. But the most dramatic change

in our attentional processes is in our ability to do two or more things at a time (e.g. Sit and Fisk, 1999). For example, there is a marked ageing effect in dual task situations such as speaking while driving, reading and listening to the radio, following signs and listening to announcements at train stations or airport terminals.

### Language, numerical skill and spatial ability

In the information age in which we are living, successful functioning during working life or post-retirement requires an adequate level of understanding of written information and numerical concepts. While literature and the print media may have declined, literacy remains essential for many purposes, such as filling out forms, understanding instructions (e.g. recording a video programme or taking medication as required), and understanding information whether derived from print, internet, street signs etc. The majority of such information is verbal, although there is increasing use of symbols, whose meaning needs to be remembered and appropriate actions implemented.

Numeracy is required for basic tasks such as shopping, budgeting, banking, estimating distance or duration, and for the understanding of probability (e.g. lifestyle risks, health risks, financial risks). Older people are increasingly confronted with the need to estimate such risks.

While the basic understanding of language is relatively unaffected by ageing, it becomes harder to comprehend complex grammatical structures, particularly when they are preserved aurally or when the message is implied rather than explicit (Cohen, 1981). In addition to changes in language comprehension, there are some age-related changes in language production. Advancing age is associated with increasing word-finding difficulty, i.e. difficulty in recalling the proper names of people, places (e.g. Cohen and Faulkner, 1986) and the names of objects (e.g. the name of medications), as well as a reduction in verbal fluency (see Light and Burke, 1988).

Numerical skills, such as adding and subtracting, multiplying and dividing, calculating proportions and percentages, and making estimates, all decline as we get older. Indeed, longitudinal studies of the same individuals tested over a number of years have shown that numerical abilities declined more than any other primary abilities (Schaie, 1988). Set against this is a large generational effect whereby at a given age (say age 50) earlier-born generations show better numerical



ability than more recently born generations. As with all cognitive abilities, there are very large individual differences which are related in part to education, but also to exposure to numerical concepts and the extent of practice in using numerical skills. Familiarity and practice can lead to the maintenance or improvement of these skills and to a reduction in anxiety which is often seen when people are confronted with numerical problems.

At any age, our ability to understand numerical concepts and solve numerical problems depends on the way in which the information is presented. For instance, people understand natural frequencies far more readily than they understand percentages or proportions (Gigerenzer and Goldstein, 1996) e.g. they understand the concept that a particular event occurs 3 times in 100 far better than that it occurs 3% of the time.

Our spatial abilities also tend to decline significantly with age. For example, visual synthesis, discriminating a figure from its background (even when colour and brightness contrast are good), and matching complex spatial patterns such as faces, all become more difficult with advancing age (e.g. Salthouse, 1992). Spatial orientation is also affected, e.g. the ability to find one's way around a new environment by following a map. Compared to younger people, older adults tend to have more difficulty on constructional tasks such as assembling shapes, drawing objects or copying designs.



## Learning and memory

Our ability to learn new skills and new information is extremely high during childhood and continues into our teens and early twenties. Thereafter, there is a gradual decline which means that middle-aged and older adults need to put more effort into learning compared with younger adults (Cohen, 1989). However, even in advanced old age it is possible to learn new skills, as demonstrated in some classical studies of individuals aged between 60 and 90 who were taught a new language and a musical instrument, and maintained their skills for many years thereafter (Harwood and Naylor, 1975).

From middle age onwards it is common to hear complaints of "my memory is not what it used to be," but this decline affects some types of memories more than others (Huppert, 1991). Memory for recent events is more affected than memory for remote events, and

this is one reason why very elderly people may dwell on the past. In general, memory is impaired in relation to the processing demands of the memory task; the greater the demands the greater the impairment. For this reason, recalling information (e.g. the title of a book or a street address) is far more difficult than recognising the information when it is presented. However there are two types of memory task with which older individuals have particular difficulty – remembering context and remembering to carry out an intended action. Impaired memory for context refers to the common observation that older adults may remember the content of information (a fact, a story, a joke) but not remember the source of the information (e.g. who told it to them, whether they saw it or heard it). An extension of this is that elderly people may not remember whether they actually saw an event taking place, or only heard a report of it. The other type of memory which shows marked age-related impairment is prospective memory i.e. remembering to carry out an action (Huppert, Johnson and Nickson, 2001). In the absence of a reminder, older people are far more likely than younger people to forget to perform an action, such as posting a letter, keeping an appointment or taking medication. All of us have prospective memory lapses at times, but because older people are aware of their frequent lapses, they are more likely to use memory aids such as diaries, alarms and other forms of reminder.

## **Executive function**

Executive function is the term given to the set of higher level cognitive processes which involve organisation of information, generalisation, planning, decision-making, problem solving and mental flexibility. Increasing life expectancy has created a need for maintaining good planning, decision-making and other executive capabilities for a greater number of years. The high value placed on independence and self-reliance also means that executive capabilities are more important for older people than ever before. As an illustration, increasing numbers of older people drive cars, and driving is a complex judgement and decision-making task that requires people to be perceptive and vigilant, and assess correctly a complex and rapidly changing situation. The design of cars and traffic signals has a great impact on the duration for which older drivers can drive safely.

Today's older people are fitter, healthier, wealthier and more independent than ever before

All aspects of executive function are influenced by the ageing process (Wecker et al., 2000), but as with other cognitive capabilities, the degree of decline or impairment is strongly associated with education and experience. Both older and younger adults have limited resources to deal with complex decisions and the great quantity of information with which they are faced, and these mental resources tend to decline with age. However, people are adaptive, and frequently use mental shortcuts or seek assistance from others where appropriate. Problem solving and decision-making are also influenced by social and political attitudes, cultural background and individual attitudes towards taking risks.

### Implications for design

- Very rapid presentation of information should be avoided, since older adults process information more slowly than younger adults.
- Competing inputs from the same or different senses (e.g. CNN style presentation) are not well suited for older adults who find it more difficult to switch attention and monitor multiple sources of information.
- Verbal information should be grammatically simple and the relevant messages made explicit. Written information (provided it meets the visual guidelines above) is more readily absorbed than aural information.
- Numerical information should be presented as simply as possible and natural frequencies should be used in preference to percentages (e.g. 1 in 1,000 is more readily understood at all ages than 0.1%).
- Spatially complex information should be avoided, both for comprehension and performance e.g. constructional tasks.
- Designs which impose a high demand on memory should be avoided, such as activities involving a sequence of operations which need to be memorised (e.g. programming a washing machine or video recorder). The memory load can be eliminated by cueing each step in the sequence.
- Care should be taken when introducing novel symbols, acronyms etc. that there has been sufficient opportunity for learning of their meaning to take place.
- The provision of cues or reminders is important in situations where the person needs to remember to carry out an action (e.g. take

- medication, turn off the cooker, lock the door, put out the dustbin).
- The need to make rapid decisions should be avoided. High-pressure selling puts older people at a particular disadvantage.
  - For complex decisions, such as those involving health care or finances, consultation with others should be encouraged.

## Summary

Stereotypes of older people do not apply to the senior citizens of today. Today's older people are fitter, healthier, wealthier and more independent than ever before. Inclusive design has a crucial role to play in maintaining their health, capability and independence. Inclusive design can also minimize the difficulties encountered by those who have impairments, thereby preventing them from being disabled by their impairments. Designers and manufacturers who meet the challenge of ageing will find a receptive and growing mature market. Those who fail to rise to the challenge will be left behind.

## Acknowledgements

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## Chapter 2

# The struggle for independence

**Marion Bieber**

University of the Third Age



This is a personal account of the struggle for independence of an octogenarian and the impact of appropriate and inappropriate design on her daily life. Independence in the home, in public places, in travel and leisure activities are all strongly influenced by design which does or does not take account of the issues discussed in chapter 1 by Felicia Huppert. This chapter illustrates some of these issues as experienced by its author.

## Who am I?

I am a retired woman who has been in full employment since the age of eighteen and am now eighty one. I have three major age-related physical problems:

- Impaired sight: corrected by cataract operations and spectacles.
- Impaired hearing: corrected with two digital hearing aids.
- Moderate walking difficulties: aided by use of stick and banisters on stairs.

## My principal occupations are now:

- Reading, writing on computer.
- Leading a study group on 'Design for all Ages' in the University of the Third Age in London.
- Running a French Club in the local library.

## My leisure activities are:

- Reading and listening to classical music.
- Listening to the radio and occasionally watching TV programmes.
- Theatre and concerts.
- Travel in UK and abroad.

I do not drive anymore, which limits my activities somewhat, but enjoy walking, and it is important to remember that all the above are strictly limited by financial considerations.

While I pursue all these activities with energy and enthusiasm, I find myself constantly frustrated by restraints imposed by inappropriate design. Many of these would be greatly reduced if environmental and product design had taken the impact of the ageing process more concretely into consideration.

It is, I think, fair to say that millions of people are in similar situations to my own, although I am certainly one of the more fortunate ones. Let me try to explain the relationship between my daily life and the quality of design, in the context of the activities I pursue.

## Reading

**Public announcements on stations are a constant cause for stress and confusion**

My reading is frequently hampered by the current design fashion of giving priority to general appearance of a document rather than to the text which the user wishes to decipher. My main problems are related to shaded background on theatre and concert programmes, lack of contrast between background and print and the frequent overprint of illustrations. In addition the use of shiny print surfaces which reflect light rather than highlighting the print are a further impediment. This means that information that would be useful to me is difficult to access. This lack of readability is even more prevalent in the case of printed information in public environments, though it is not necessarily due to type size, paper quality or shaded backgrounds. Maps in the London Underground suffer from poor positioning of light so that print cannot be deciphered from the other side of the gangway in the compartment.

A major environmental design problem in the UK is the signage of street names and house numbers which, unlike most other countries, are not in uniform positions, are often obliterated by trees or street furniture and are not lit up. This is a major safety hazard for everyone and, in particular, the older citizen. Information printed on equipment can be equally difficult to read. Keys on all IT equipment, in particular mobile phones, need to have much clearer print, and the keys should be positioned with maximum space between them to allow for the less nimble fingers.

## Hearing

My hearing impediment is not an unusual one. And yet, public announcements on stations are a constant cause for stress and confusion. Levels of background noise increase the sense of hearing loss and diminish the quality of sounds. Added to this is the poor speech training for those who make the announcements and the choice of timing, which is designed for announcements to be made just as a train arrives at the platform. In my view there needs to be much closer cooperation between the designers and acoustics experts.



Good taps are a joy.

Background music in all public places is probably one of the most frustrating and stressful elements in my daily life. It not only drowns all public announcements and conversation but it impairs the hearing of everyone. Here again, there is a link between designer and provider. Radio and television producers share this responsibility to the older listener.

## Mobility

We now come to mobility impairment and its impact on my daily life. I appreciate the problems of the age of many installations in our public environment. While it is not possible to destroy or rebuild all our antiquated tube and railway stations or our old buildings, much could be done by designers and construction engineers to meet the needs of people like me. There is clearly a big gap between the adaptation of old installations and the design of new ones. Nevertheless, I would like to propose some basic changes which would help me and could be introduced by designers in collaboration with the contractors of design. For example:

- Stairs with no or only one banister are hard for me to use. Deep steps require the 'pull up movement' which demand a banister on each side.
- Swing doors which require body weight to open threaten loss of balance and a fall. All doors should have handles to protect against this.
- Seating facilities in long corridors would be desirable.

One of the first points which do not appear to be understood by designers is that old does not mean disabled and that the vast majority of older consumers are not housebound, in a wheelchair or in need of care. However, older people become constrained by the way in which the surrounding environment helps or hinders them, by places where they do not feel 'safe' and by the fear of accidents which deters participation in the wider world. I am happy to report that the majority of us only need designers to better understand that appropriate design not only improves the quality of our lives but makes us more satisfied customers.



Electric plugs are too low down.

**There is clearly a big gap  
between the adaptation  
of old installations and the  
design of new ones**



### In my home I need:

- To be able to get in and out of my bath alone. This means having non-slip surfaces, easy to use taps and adequate handles to prevent falling. The same applies to shower cubicles.
- To have easier access to electric plugs and light fittings. This means plugs in the right position, fewer ceiling lights and more standard lamps with easy bulb replacement. Halogen lamps have bulb protective plates with tiny screws which I find hazardous and difficult to detach.
- To use a step-ladder that is light weight and gives me the necessary security to avoid falling. This means long handlebars and large, non-slip surfaces on the steps.
- To get in and out of chairs with ease and dignity. Ideally this would mean adjustable height and strong arms combined with pleasing design.
- To have work surfaces which equate with my diminishing height.
- To have cupboards and shelves accessible with minimal use of step-ladders or stools to reach.
- And all of the above should be aesthetically acceptable in a domestic setting.

All of the above considerations would help me maintain my independence for longer and could be incorporated in general design for everyone.

### In the public environment I would welcome:

- Better street-lighting, both in design and maintenance and light range. Pedestrians also need light, not just the drivers.
- Even surfaces of pavements and curbs, to reduce trip hazards.
- Legible and well-lit street signs, including notices of parking restrictions.
- Removal of bicycles from pavements.

Many of these needs could be met by better design, more frequent and effective inspection and public works maintenance.

### My wish-list in the field of transport is a long one:

Bus design is improving, but there is still need for a better understanding of the needs of the older traveller with regard to access to platforms, seat sizes, leg-room, handles and rails and access to

stopping signals. While I am aware of the lifespan of buses and the slow introduction of new models, even the design of new models could still benefit from more consultation with users.

Bus stop design also shows signs of a better understanding of the needs of the older traveller, but the names of stops are still not visible when you are sitting in a bus and need to know where to get off. Route maps in buses need urgent design improvement and universal application.

Train design is in need of far more inclusive design with regard to access to trains, gaps between platforms and trains and luggage racks in compartments. Handles on the gangway side of seats are far safer than the new knobs, which are too small and slippery to grip and threaten a fall if the train moves abruptly.

With the ever-increasing number of non-drivers – older people in particular – there is still a need to be able to carry shopping, suitcases and grandchildren on our journeys. Inappropriate design in this respect is a frequent hindrance for me, forcing me to seek help. It is also a cause of accidents.

An airport is probably the most stressful environment for the older traveller. And yet, many older people have the time and desire to travel. I find that:

- Timetable screens and other IT indicators are frequently badly positioned, the type-size is too small and there are often light reflections which prevent easy deciphering.
- Seating is generally too low and without arm-rests.
- Direction indicators to departure lounges are hard to follow in most UK airports .
- Toilets in departure lounges nearly always require the use of stairs when time is short and stress levels are high.
- Public announcements are nearly always inaudible due to inadequate attention to positioning of amplifiers, poor acoustics technology and unnecessary background music.

In all of the above there is no better road to improvement than constant consultation with the user before designs are developed.

**An airport is probably the most stressful environment for the older traveller**



81 today! All my marbles, but limited physical dexterity.

**Good design of the environment, of tools and products for daily chores, for housekeeping, travel, gardening, leisure activities and communication, will become more important as the lifespan of the population extends**

## Products and packaging

It remains for me to deal with product design and the way it impinges on my daily life.

Packaging has enjoyed quite a lot of attention by designers, manufacturers and some enlightened retailers. However:

- opening my packet of fish without a pointed knife is still a problem.  
Where is the long lip to pull off the plastic cover?
- the squeeze-and-turn tops of many containers are totally impossible to open with my weak or arthritic hands. Given the safety aspect of some of these products I hope designers will take up the challenge of finding an alternative.
- ring pull opening also requires attention. The rings are too small for many fingers and frequently have sharp edges. My need for first-aid attention runs high!

Clothing is probably the area of the greatest frustration for the older consumer. The attention to fashion instead of style and the constantly changing requirements of the youth market have put all quality and style design on the back burner. People's shapes change as they age, they don't have the dexterity to deal with complex and fiddly fastenings, and their colour vision is often altered due to cataracts. However this is not to say that we don't want to look smart and stylish. For instance, comfortable shoes still look as though we all want to run marathons or climb mountains. I only want to walk and look reasonably smart to go about my daily work and leisure activities.

It is with joy that I learn that attention is being given to a review of sizing in the clothing industry. Professor Philip Treleaven's, University College London project related to the National Sizing Survey has raised my hopes for an improvement in this respect.

Designers still have a long way to go to change their image of who the majority customer is and to give the attention they devote to the youth culture to the older customer as well. We all have ambitions of style and elegance but let these be coupled with comfort and ease of use.

## In summary

While it is true that older people aspire to a more secure and comfortable way of life, they also want to enjoy their leisure and, above all, to maintain their independence. They do not want to become a

burden to their families and friends. They want to be physically and mentally active and appropriate design is one of the vital requirements for the satisfaction of their needs.

Good design of the environment, of tools and products for daily chores, for housekeeping, travel, gardening, leisure activities and communication, will become more important as the lifespan of the population extends.

The message is simple, but it won't get through so long as publicity experts exclude the older consumer from their advertisements and images. The segregation of the population by age-related media publicity renders a disservice to the markets and to the individual older consumer.

I believe that understanding the needs of the consumer of all ages is vital. What I call good design is appropriate design for all to enjoy and that can only be achieved by changing attitudes to ageing, and constant consultation in the early stages of idea development. User forums and consultation with people of all ages is, in my view, the most effective way of satisfying the needs of the consumers. If the bottom line matters and the market wants to lead, then the consumer has to be satisfied and allowed to remain independent.

Let good design for a well-integrated consumer public prevail, and let as many as possible of your customers remain independent.



Lampshade change requires two hands, but one also needs to hold on!

## Acknowledgements

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Thanks to Graham Wacholder for taking the photographs in Marion's home. Graham is a retired architect now active in the University of the Third Age in London, and a member of the 'design for all ages' design study group

## Chapter 3

# Lifestyle, design and disability

**Katy Owen**

Disability awareness trainer

**Malcolm Johnston**

The London Institute



This chapter is concerned with lifestyle and disabled people. It discusses how disability can be defined as the limitations imposed on disabled people by society. Researcher Malcom Johnston discusses contrasting models of disability and how those have shaped attitudes towards disability. He also outlines the results of a research survey into disabled people's lifestyles and the key consumer groups it identified. Disability awareness trainer Katy Owen's personal views and experiences are used to illustrate the reality of living as a disabled person and how inclusive design can help.

### Disabled consumers

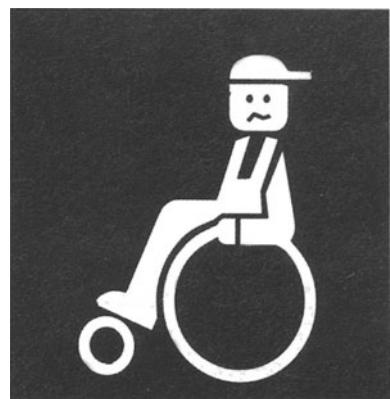
The ability to go shopping is considered a fundamental right of UK citizens. It symbolises being integrated into the commercial fabric, being 'one of us'. But do we all have access to that world? And if not, what are the consequences, and what can be done about it?

For disabled consumers, particularly for wheelchair-users like myself who grew up in the 1960s and 1970s, products were invariably too big, ridiculously cumbersome or over-expensive. The problems were compounded if customers were exceptionally small, wide or physically twisted. In that era, getting into a shop was a challenge in itself. Many had enormous steps at their entrances, advertising billboards in the aisles or flights of stairs inside and no lifts, putting upper storeys off-limits to the majority of disabled and elderly customers.

Disability outlets provided and still provide the alternative. These, however, focus fully on 'disability' – wheelchairs, sticks, calliper boots and double-handled cups. This is off-putting to customers like myself who want to maintain our individuality, diversity and normalcy.

### Different but normal

Different but normal: these are the buzzwords for people like myself. When we go shopping, we don't feel 'disabled'. The word is not engraved on our brains as we search the shelves for spuds. We have the same desires and aspirations as the next person, if not the physical means to follow them through. We are all 'differently able' or 'normally able' to a greater or lesser extent. Any one of us can experience disablement at any time in our lives, though the risks increase as we age. So where does disability end and ability begin? While greater thinkers than I ponder that one, differently able people like myself



**Disabled people were viewed as medical curiosities or even freaks**

declare ourselves normal, in the context of our identities, and let it rest. We are well adjusted and have balanced outlooks on life.

## Disability models

Throughout history, society has attempted to understand disability with a view to shaping and, where necessary, intervening in disabled people's lives. In the past, fear and prejudice led to disabled individuals being hidden within families or ostracised in orphanages, 'special' schools, day centres or residential homes. The tendency to locate disability aids and adaptations in specialist outlets reflects the same mindset. To date, two theories or 'models' of disability have been devised: the medical and social.

The Medical Model (1900s–1970) was devised by the majority, normally able community, and particularly by doctors. It medicalised individuals by defining them in terms of their physiological impairments and placed responsibility for disability with the individual. Disabled people were viewed as medical curiosities or even freaks, excluded from mainstream markets and services and controlled as to when and where they could shop, use public transport or access personal finances (assuming the system permitted them any money of their own). The onus was on the differently abled – to fit in, make do and be satisfied with what was on offer. If clothes did not fit, shoes weighed the proverbial tonne and wheelchairs were too cumbersome to be successfully operated by the user, well that was tough.

The Social Model (1970 to the present), in contrast, was developed by and for differently able people. Disillusioned with their lot, the differently abled redefined themselves within society as a whole. In this model, disability is seen as being primarily caused by society: by a failure to provide suitable products and amenities. It is important to note that some of us experience more limitations than others. I wouldn't stop having a specific disabling condition if shopping centres were more accessible and I had more money to spend because of a flexible DSS benefits system. However, the social model of disability helps the disabled community to highlight a broader process of disablement than is involved in medical history alone. In short, disability is everyone's problem and everyone's business.

This approach gave rise to the principle of 'inclusive design': a collaboration between disabled people and product designers to create

more diversity and to reach a broader range of people. Some progress has been made: today fashionable clothes are available in a wider range of sizes, and many electrical goods are easier to operate and have remote control. Such developments don't only benefit disabled people. For disabled customers, however, as highlighted earlier, product design is only part of the problem. There is the question of physical access to shops, transport and finances. The more disabled the person, the more planning and research an outing involves. Which is the most accessible route? Where are the drop-down curbs? Are there any wheelchair-accessible buses? And which parts of which shops will be accessible when you get there?

If this is society's problem, as the social model of disability proposes, society has a lot of work to do. One innovation that should, in time, prove helpful is the 1995 UK Disability Discrimination Act (DDA).

### The DDA

The Disability Discrimination Act calls for 'reasonable' adaptations to be made to public amenities within the realms of education, employment, transport, goods and services. The legislation is phased in: service providers have a certain number of years in which to comply.

Until 2001, the DDA only had an advisory body, through which disabled people could make complaints. These would be passed on to offending establishments, who would be 'advised to make changes to fulfil legislative requirements'. In March 2001, the Disability Rights Commission (DRC) started work. Not yet on a par with the Equal Opportunities Commission, which will prosecute offenders on complainants' behalf, the DRC will help 'us' to take legal action. However, litigation can only commence at the end of the full phasing-in period, and legal aid will not be available.

The phasing-in period for the goods and services category spans from 2001 to 2004. But it is widely suspected within the disabled community that companies and owners are delaying adaptations to see what exemptions will be allowed on economic, external environmental and historic grounds. The final category in the DDA remit, transport, will not be phased in until 2010–2014. Potential litigants will have plenty of time to save up, at least! Where possible, it would surely be easier – not to mention cheaper in the long term – to implement inclusive design features at source, rather than be forced to make drastic



changes in order to comply with legislation. If basic designs considered differently able people, only moderate adaptations would be necessary to meet individual requirements.

### The Dutch example

Holland has taken such innovative thinking and followed it through, setting an example that Britain would do well to follow. After World Wars I and II, Dutch institutions collaborated with business, social-service organisations, municipal service providers and government to introduce inclusive features into mainstream environmental design at source. The guiding principle is that everyone who lives long enough eventually incurs disability or long-term debilitating illness. New properties therefore have wheelchair-width doors and corridors; each property with multiple storeys incorporates a wheelchair lift or stair lift; entrances/exits are either ramped or flat. All public transport vehicles, retail outlets, schools and other public buildings are similarly accessible. The costs are covered by a mix of private, public and charitable funding.

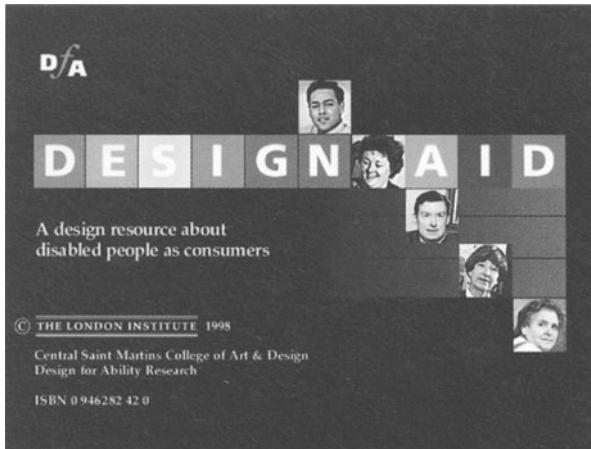
Moreover, Holland extends its equality-based lifestyle approach into community care services. There are designated homes in every housing project for carers/facilitators, who, by prior request or having been called by intercom, fulfil personal care duties for residents. This initiative is funded in a similar way to the public access projects and, as it is sold on the basis of benefiting everyone, it attracts little if any criticism.

**The UK comes a very poor second to Holland in the implementation of inclusive design.**

### Design Aid

The UK comes a very poor second to Holland in the implementation of inclusive design. But there are at least efforts afoot to improve the situation. Design Aid for Ability research, which aims to help UK designers understand the needs and aspirations of disabled people, is one such example. A telephone survey of a cross-section of disabled people – 600 in all – was orchestrated through the London Institute's Central St Martin's College of Ability and Design. It was the first market research into the lifestyles of disabled people.

The Design Aid CD, published in 1998, identified five distinct consumer groups. In most respects, research suggests that the general population aligns with five similar groups – which is what you might expect – differently abled people being essentially the same as normally



Screens from the Design Aid CD.

abled people. Of course, people don't all neatly fit into these categories, but such classification is none the less a useful tool for designers.

Members of Consumer Group 1 are clearly identified by a general attitude towards life of independence, self-sufficiency and optimism. They typically have the most limiting impairments, with 69% unable to walk and over 50% having a congenital disability. They accept their disability as a challenge and may pursue sport to a competitive level. Political action is seen as the way to achieve better work and career opportunities. Their interests include science fiction, enthusiastic Internet surfing, pop and rock music and going out to pubs and nightclubs. Their age range is 20–40 – the youngest of the five groups.

Consumer Group 2 is primarily defined by its members' views on society, which are reflected in their participating in voluntary work. They hope to be perceived as socially aware. Political action is seen as very important to improve public facilities and to provide more financial support for disabled people. Members of this group are vocal about access to buildings and public transport. Typically married, they are often parents, and family life places a heavy demand on income, particularly as they are inclined to become involved in many social activities, enjoy going to public events and have a wide range of interests. Their ages range between 31 and 50.

Education and home ownership particularly identify individuals in Consumer Group 3, who often hold degrees and postgraduate awards, and whose age range of this group is 41–50. They show acceptance of their situation through confidence in making decisions and an



Architect Andrew Walker designed his kitchen to suit his lifestyle and capabilities.

aspiration to influence others, while being prepared to seek help when necessary. Correspondence or petition are seen as more effective politically than demonstration. Members of this group are proud of their intelligence and curiosity, tending towards intellectual interests and activities. They keep abreast of current affairs, being avid newspaper readers and taking a particular interest in European issues. A desire to be well informed also expresses itself in their consumer trends and views on diet and the environment.

The main defining characteristics of Consumer Group 4 are: trust in established organisations, such as religious movements; an aspiration to be happy with their situation; home ownership; and the magazines they read, such as Reader's Digest. On a day-to-day basis people in this group try to be self-sufficient, but they have a tendency to depend on medical agencies. They believe in their own intelligence and their knowledge of 'what is best', which is defined by their family and religious values. They are more attracted to the familiar than the unknown, especially in relation to food, holiday destinations, clothes and music, having generally conservative tastes. The members of this group are aged 41 years and over.

Consumer Group 5 is significantly defined by a dependent attitude towards life, with individuals particularly expecting assistance from government and medical agencies. It is also distinguished from the other groups by socio-economic profile: people in this group are usually more than 70 years old and live in rented council housing. Their outlook is pessimistic, and they feel victimised by the world around them. A striking feature of the group, compared to the others, is that they happily show off their aids to daily living, possibly seeking sympathy and support or recognition of their situation. They have very few interests and undertake few activities.

The Design Aid CD provides designers with a highly visual interface, allowing easy comparison of information. It also enables numerous 'visual references' to be clipped and pasted into 'style sheets', which can be assembled to help define the qualities of specific products or services.

## Katy Owen – a personal view

To my mind, at least, the statistical evidence highlighted in the Design Aid CD rings true. I fit in most closely with Consumer Group 1, though from my perspective there are some overlaps in lifestyle between Groups 1 and 2. I am 38, I was born disabled and view it as a challenge to be lived with and overcome whenever possible. It is no exaggeration that I am proud of my credentials as a 'differently abled' woman.

I am a graduate with a BA honours degree in arts and social science subjects from the Open University. Unfortunately, regular work is hard to come by, but I provide disability awareness training and am a freelance journalist. Many of my past and current employment commitments are unpaid. I am a member of some local and West Midlands voluntary organisations, on whose behalf I complete journalistic projects.

I am fortunate enough to be largely self-sufficient, purchasing the lifestyle of my choice. I own my own bungalow. I am single and live independently, with personal care assistance provided by the care agency of my own choice.

I use e-mail and surf the Internet for research purposes. I am interested in socialising, going to the cinema, occasionally buying (mostly renting) popular videos or DVDs and listening to the radio, and I own my own car.

I feel the research also holds true for the older age groups. There is a correlation between age and infirmity, increased poverty and dependence on caring institutions. My home town, Stoke-on-Trent, has its fair share of deprivation zones as well as prosperous districts. Unemployment, disability and/or poor health, bad housing and poverty tend to co-exist. The older and more frail an individual is, the fewer their lifestyle choices. Run-down council property and involvement by health and social service agencies shape such people's lives, and agencies struggle to meet demand. In one recent notorious case, a pensioner amputee had to wait more than two years for a social services bath-hoist, without which he could not use his bath.

Overall, the Design Aid CD reveals that, wherever possible, people wish to live their lives and fulfil themselves in the mainstream. To achieve that, full access is a prerequisite. If designers consider a full range of abilities while a product or service is on the drawing board, it will always be possible to broaden the user base and open up different



areas for all. Any product, environment, service or system of services will benefit from inclusive design.

### Into the mainstream

Save for the outlets of a few pioneering companies, mainstream shops cater exclusively for the normally abled. So if you want to buy a mug to hold a hot coffee with two hands, because your grip is limited, where do you go? The best bet will be the nearest Disabled Living Centre or a mail-order catalogue, but the latter means buying without seeing and the former is likely to require a long journey.

Yet there are a lot of people who could use such products – and who would like a choice, too. The sooner retailers wake up to the possibilities of catering for the differently abled, the sooner they and we will benefit.

The Disabled Living Centres Council has been campaigning for the integration of their centres into mainstream retailing for many years. One success story in this area is a scheme pioneered by the organisation Awear, in which clothing retailers provide disabled customers with assistance and special tailoring. Such initiatives have a clear incentive for retailers: disabled people provide a new customer base, and such customers may well be accompanied by a companion or carer, bringing more customers into a store.

### Inclusive environments

Many obstacles exclude differently abled customers: interior shop designs, the layout of shopping precincts, transport methods. If any one element is at fault, the whole system breaks down. For example, dropped curbs and level gratings are vital to promote ease of access. But it's not unknown for a wheelchair-using pedestrian to be stuck in the middle of traffic because there was a dropped curb only on one side of the street.

Although progress is being made in the accessibility of public transport, an example from Stoke-on-Trent demonstrates the possible pitfalls. Some 'kneeler' buses, which can lower their suspension so that the entry platform is level with the pavement, were recently introduced to the city. These require higher pavements by the bus-stops, but the pavements have been raised only at stops on routes in the main commercial districts – tough if one has to deliver a disability awareness

training lecture on the other side of the city. Similar considerations apply to a new audio announcement loop system in Birmingham, which advises visually impaired travellers of forthcoming stops. Announcements must be provided on all routes, not just a selection.

Public spaces and services will benefit most from inclusive design, and require most consideration, because we all use them. Dropped curbs already help users of pushchairs as well as wheelchairs. Re-designing automated cash dispensers could give wheelchair users access and also assist visually impaired users. An additional button on pedestrian crossings would allow a longer delay to be selected, enabling people who can't walk well to cross in confidence.

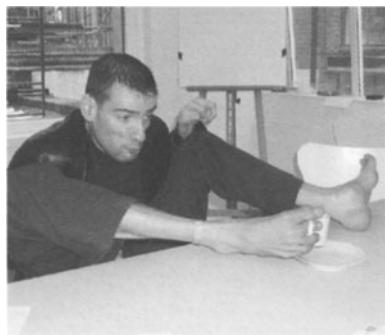
Interiors also need attention. When shopping for clothes, for instance, wheelchair users are often forced to guess the right size because we cannot use the empty, curtained box that passes for a changing room. (Has any shop manager attempted to dress an aged relative in one of these areas?) So we are forced to return items that prove a size too big or small, that have fastenings that are too stiff to operate or dig in too much, or that turn out to be made of synthetic fabrics or contain allergenic dyes.

## **Virtual and real access**

In the meantime, a shopping trip continues to resemble a military operation for disabled people. The Internet can be a convenient alternative. Computer technology demolishes barriers of distance, impairment and language, and – if you have a debit or credit card – puts a shopper's paradise at your fingertips.

But a paradise for whom? Are we devising another set of haves and have-nots? Will households without Internet access become the next deprivation zone? And is the Internet necessarily liberating anyway? If you see everything in a virtual world, if you interact over video links, if goods are always delivered to your door, the home can become a prison.

Personally, I value seeing whom I am addressing. Likewise, I like to see what I am buying. How do I know if a T-shirt will really be the colour of the picture on a web page? And as an 'awkwardly sized' customer, I may have to return a garment because it doesn't fit. With fresh food, being on the spot is even more important. How can you



Website designer Rob Williams advises on a drinks container design project.

know if a pear is ripe without smelling and touching it? The Internet may be a useful tool, but virtual access is no substitute for real access.

### Inclusive products

Household products also benefit from inclusive design. Manufacturers need to have a recognisable brand, and this leads to many variations in design detail. But who would not buy a washing machine because the lettering around the dial stood out clearly against its background? Would a refrigerator whose main compartment was at comfortable viewing height, or whose shelves pulled out on secure runners, giving access to items at the back, find fewer buyers? Or would it win more, attracting users unable to bend down or lift their arms above shoulder level?

Manual dexterity, cognitive ability and visual acuity all need to be considered if an inclusive design is to succeed. Who knows – we might all end up being able to programme our video recorders!

Simpler products also need thought. How many people, like me, have limited finger strength? A toothbrush was recently purchased on my behalf, but the control button was too stiff for me to operate. As with fruit and vegetables, it is essential for differently abled people to see and touch products they use every day. And again, sales will improve if such details are considered.

Finally, 'look' is important. This matters to everyone, whatever their abilities. But design can be stylish as well as inclusive.

### Sharing costs

So why is an inclusive approach not part of every design brief? Ignorance about its potential (or even existence) is surely the main reason. Cost is also cited as a deterrent. But if the brief is to cater for the widest possible user base, additional sales are likely to compensate for any additional design time. However, there will always be services and products which involve additional costs. Many of these will be where there is a legal or social requirement to cater for the maximum possible user base. An example of this are the dropped curbs and other inclusive design features of public spaces, the costs of which are distributed across the whole community through the Council Tax.

Cost-spreading can work in various ways. As already suggested, in some cases extra costs will be recouped over time through extra sales. High profits from certain models can subsidise lower profits

from others. Companies can subsidise a particular division to improve corporate image.

Insurance services provide examples of inconsistent cost-sharing. Insurance works by spreading risks across a large group of people. The cost of insuring a household consisting of a disabled person and a carer should not be significantly different to the premium for a family of four, for example. But when recently moving into my own property, I faced a daunting interrogation, having to explain that I had another householder with me, but she was not a relative, and she would regularly be replaced by another non-relative, and so on. I finally acquired an appropriately priced insurance package, but without care I might have had to pay much more. I was seen as 'different'. An inclusive approach to the design of household insurance would have anticipated the situation.

The insurance of taxis is another example of exclusionary policies. A 'wheelchair-conveying' taxi (which incorporates portable aluminium ramps and anchoring straps, to aid wheelchair admittance and safe transportation once in the vehicle) constitutes a 'private wheelchair ambulance' for insurance purposes. The result is that wheelchair users have to pay a £6 insurance fee in addition to the cost of each fare.

## Inclusive benefits

Anyone can become disabled and find themselves labelled 'different', and the older you get, the more likely this is to happen. Adaptations such as wide supermarket aisles and low-reach shelving will benefit most people at some point in their lives.

Inclusive design can help address all our needs – so get out there, inclusive designers! Talk to us, and design products and services appropriately. Supplying goods we can all use in environments we can access – putting everyone on a level platform – will increase sales. So be bold! Dare to trust us as well as yourselves. After all, the customer is always right.

## Acknowledgements

Chapter title image: CanDoCo by Anthony Crickmay; Andrew Walker and Hilde Holger by Ivan Coleman



Hilde Holger teaches a dance class from her stair lift at age 91.

## Chapter 4

# Disability unplugged

**Judith Payling**

Dare Foundation

**Angela and Peter Zein**

Interviewees



## Whose agenda?

Inclusion affects us all, it is not about 'them' and 'us'. The agenda for inclusion is a national one. It requires everyone to consider how every aspect of life can become more 'inclusive' and more responsive, breaking down all discriminatory barriers, be they impairment, race, gender, religion, age, ethnicity and class. The majority of issues raised in this contribution are linked to the attitudes, assumptions and expectations of others about disabled people: what they want and how they will respond when they get it. Listening to disabled people may lead to a re-evaluation of how we all conduct our daily lives. This promotes bridge-building, exploring experiences outside our own, so that everyone, disabled or not, gains an understanding of the others' concerns, perspectives and solutions. Inclusion is not about producing solutions to meet a particular range of needs; it is about a change in our thinking.

This chapter is a record of an interview with Peter and Angela Zein, a disabled couple who lead an ordinary life in Kent. It highlights some of the concerns disabled people have about social attitudes that inhibit their potential to take part in the commonplace activities of everyday life. It is not a case study; rather it seeks to act as a trigger to encourage a different perspective on disability. Angela and Peter discussed with the researcher how much information about their impairments to impart. They have concluded that anything further than that included within the context of the interview would be an intrusion. The interview is not principally about their disabilities. It is much more concerned with the constraints they face in their daily lives, a function of social attitudes, poorly-designed products, inadequately-planned services, and legislation which, in its implementation, unconsciously disadvantages disabled people..

Listening to such experience is vital if mainstream products are to be designed taking proper account of the needs of disabled people. An exchange of information between designers and disabled people will ensure that segregation and isolation are no longer the common experience of young disabled people as they grow up (Murray, 2002) and of older people as they become less capacitated. Disabled people can act as researchers, consultants and experts on disability issues, and, as such, they have much to offer at all stages in the design process.

**They don't see me as disabled  
in the pub but I have learnt if  
they come to our bungalow  
they are not the same  
because they think that we  
get 24 hour care**

We pay for our own carers,  
we employ them. We hire  
and fire them

## The interview

The narrative offers an insight into how an ordinary couple, wanting to go about a fulfilling life, are seen as somehow extraordinary if they want to have and to do the same things as their able-bodied counterparts. The interview illustrates the frustrations disabled people have with the way in which services for the public are set up. Angie and Pete call for greater attention to be focused on helping people to change their attitudes. They believe that too often disabled people are excluded because of the risks perceived in their inclusion. A more inclusive approach to the design of products and services, which takes the needs of disabled people more specifically into account, offers a richer range of options to everyone.

There is much talk of 'empowering' people, and yet there seems to be little action to support this rhetoric. Listening to people is a step in the right direction. Therefore this interview is largely uncut and presented as an exchange of ideas between the interviewer and Angie and Pete.

## Setting the scene

Pete and Angie have been married for five years. They live in an adapted house which is one of ten owned by a housing association. No care is provided. Pete likes teaching and helping people new to communication aids. Sometimes he helps at a school for children with special needs. He goes there on their open day, to help the teachers and children and their families to understand what it is like to communicate using an assistive device. He likes going to the pub and loves cars and would really like to do a parachute and a bungee jump, but as he says:

"They don't like doing these with disabled people."

Angie, his wife, interrupts at this point and indicates she would rather he did these things than start running as she wouldn't be able to keep up. Pete feels it is important to him to go out and meet people because he is keen to be part of what is going on; he does not see that he should be excluded because he has difficulties speaking. He wants to ensure that others understand that he understands and that he is not thought of

“as a piece of furniture in the room”.

He finds that people's attitude to him changes with the environment.  
He observes:

“They don't see me as disabled in the pub but I have learnt if they come to our bungalow they are not the same because they think that we get 24 hours care.”

Pete's wife Angie confirms this

“they treat you differently if they see the house because the street is full of disabled people so they automatically assume that we are looked after and plus, there is a big care home just at the back of the trees there, so they assume that we live on the back of them.”

Interestingly she goes on to say:

“When they don't see us in our home environment – we don't go in the pub with carers and things – they are alright there because they know that we are independent.”

Pete and Angie believe this is because people think they don't pay for anything themselves and that others handle their affairs for them. Angie recounts how people walk into their home for the first time and say things like:

“Aren't these houses nice. As if to say that someone else has decorated it, someone else has put the work in.”

As she points out, like most couples when they moved in to their home, they had only a TV and a bed. Both she and Pete feel proud of their home and the effort they have made to create a place that reflects their individuality and taste.

Another aspect of life for Pete and Angie is that they have support from paid carers. Angie feels that people who don't know them well

“assume that this also organised by someone else and that the government give us anything we need.”

She often finds it necessary to explain that:

“we pay for our own carers, we employ them. We hire and fire them. They think we are looked after and babysat. They think it is all handed to us on a plate. It is hard for people to recognise that we have done it, not that someone else has given it to us, handed it to us.”

These assumptions can be difficult to combat. Angie and Pete feel they must meet and talk to people which, whilst enjoyable in itself, helps others to learn about the way in which they live their life. They believe this also helps people to see them in a different light:

“As people too.”

Pete spends a great deal of his time trying to educate others about the different requirements disabled people have of society. When asked how he achieves this, he replies that since children are our future, he concentrates his teaching upon them. He also believes he should go shopping by himself and go out to see his own friends. He values opportunities to do things on his own because he says that:

“To find freedom to be myself – sometimes you need time for yourself.”

This is a key to maintaining his sense of independence. He adds that this helps him challenge the view that disabled people always have to do things with support. He says people are usually very surprised that he works and that, with his communication aid, he can think and talk fast like talking people. Pete knows it is important for people to take time to meet and talk with him so that they understand how much he can do, how fast he thinks and how he can teach others about communication, in general, and in particular, how to do this effectively using an assistive device.

Often when Angie and Pete meet people for the first time they talk to Angela first, a statement acknowledged by the interviewer as her first action when she arrived. She found that people who meet Pete for the first time and discover that he can't speak, then start talking through her and that if they do talk to him they talk to him like he is deaf. Pete pointed out that it is similar for her, and that if Angela meets a walking person, they don't talk to Angela as she uses a wheelchair. Angela agrees:

"If I was with you, they would talk to you. If I was with Pete, they talk to me. It is so devastating. This lack of recognition as a person is maddening as we have feelings."

But Pete deals with these difficulties by dismissing them as manifestations of a lack of imagination upon the other person's part. He finds that this lack is more apparent in older people and that younger people seem more accepting of difference, perhaps because more disabled people now take part in mainstream activities and the awareness of disabled people in society is developing.

## In the home

The discussion then moved on to activities within the home. Pete likes to help Angela with the housework because this is about sharing within their relationship. He finds this part of his role is totally ignored by Social Services when they arrange for his care needs. He gets angry that, whilst they offer help with his personal care, they fail to recognise he would like help to do what he classes as his side of the chores. This would include:

"Things like DIY, things that a man would do around the house that a woman wouldn't."

Since Angela can physically do most things they won't allocate anyone to do the things that he feels he should do around the house. The Zeins have a strong sense of how the division of labour between them contributes to their relationship. At present Pete's way of contributing is to get someone in to do those physical tasks which he sees as his side of the chores, but he would really like some special tools. As Angela says:



If you die – you were meant to die, weren't you? – if your parachute is not meant to open, it wouldn't open whether you were disabled or not

"It isn't always about the money – it is about the physical task, of being able to do things like the plastering and wanting to do the DIY, which is what the man usually does."

They both expressed the view that so long as Pete is dressed, washed and clean, none of the statutory services have any further concern, and yet the potential to contribute to a relationship is clearly very important to Pete. Nobody asks questions about his role within the home. As Pete points out they are a working family and that sometimes he wants to cook; yet, as there is no recognition that this may be part of his role in helping his wife, it is not a matter for discussion. People make many assumptions about the roles that disabled people wish to fulfil, usually without consulting them. This is frustrating as someone else is making choices which have a major impact on the way in which others live their lives. Angela indicates that it is worse than this as people also assume that she is able and therefore willing to do everything all the time: and sometimes she is not!.

### Barriers to independence

The discussion then turns to some of the factors that raise barriers to a feeling of independence. Pete and Angela do their best to prevent their impairments getting in the way, but there are key factors, outside themselves, that influence their level of independent action.

One of the most fundamental of these is legislation. Pete and Angela are confident in their ability to do adventurous things, but others seek to deter them because of difficulties over insurance. People express concern that something may go wrong and that they will be sued. This is a very genuine worry, and both Pete and Angela recognise that it is out of concern for them and that other people are scared on their behalf. However this seems misplaced when the people in question are adults who are well able to weigh up the risks involved. Pete is infuriated when he is required to ask his doctor for a letter to 'allow' him to take risks. He uses parachute jumping as an example. He feels strongly that he and Angela should not encounter restrictions upon their freedom of choice that are not encountered by the able-bodied. Pragmatically she says:

"If you die – you were meant to die, weren't you? – if your

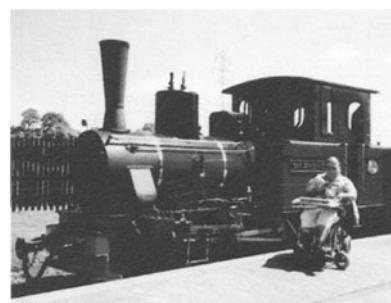
parachute is not meant to open, it wouldn't open whether you were disabled or not. If something is going to go wrong, it is going to go wrong, that is the way we see it."

As Pete and Angela see it, there are lots of laws:

"Insurance policies to cover themselves in case of injury. And even if you tell them that you are not going to sue if you break your leg – because it wouldn't bother us – to us, it is us taking the risk, not them."

Another example provided by Pete is much more common for disabled people wanting to access training or pursue a career. His story is as follows:

"I wanted to train to be a teacher at college but lots of problems arose, particularly to do with the attitudes of the staff. Everything on the course started off fine and then they just kept throwing in problems – 'we can't put the care in' – so I said I would employ a carer and they said that my carer couldn't come, on the grounds that they weren't insured for my carer. I offered to solve the problem by providing the appropriate insurance but then another problem was found. This time they couldn't afford to allocate staff to give me the amount of care in that I needed to access the course. So I said: 'right, I'll organise this', and they said, 'You can't do that because we are not insured to have your carers on the grounds.' At this point I gave up."



As Pete shows, he was prepared to address the practical and legal difficulties, but he was thwarted by ingrained and bureaucratic attitudes beyond his power to resolve. This would now be classed as discriminatory under the terms of the Disability Discrimination Act, but situations such as this are still not unknown to people wanting to access further and higher education, and even particular subjects at school. (RITE project, 2002)

Attitudes are so crucial to the feeling of being able to cope and to the feeling of independence. Angela goes on to talk about the difference familiarity brings to their experience,

**Everyone thought we were a little crazy last year because we got in the car and we drove to Scotland**

"We get on very well with our friends that own the pub. They have got stairs in their pub to the toilet, but they have no problem with me getting out of the wheelchair and crawling up, so that is what I do. But at another pub where I didn't know the people, I wouldn't be able to crawl up the stairs because they wouldn't let me do it because of the insurance."

Angela suggests this may be the reason they give, but actually it is more about the way they look at her and do not want her to crawl up the stairs in their pub. She and Pete want to get on with things and think of the problems afterwards, whereas she feels most people will think of the problems first and that causes more problems and creates a barrier before they even start. Once again they have a story to tell:

"Everyone thought we were a little crazy last year because we got in the car and we drove to Scotland, just me and Pete on our own; they thought we were crazy and said "You can't possibly do that", but we did it. We could have got a puncture, could have broken down but so could anybody else. We would have phoned the AA just like anybody else. But they make it sound like it is going to be a hundred times worse if I have got to phone the AA rather than you've got to phone the AA. As if it is twice as hard for me to pick up the phone for some reason, than it is for you. It is like when he fell out of his chair because he had a few too many to drink. Everyone else falls over once in their life when they have been out for a drink but it is suddenly a huge drama if Pete does it. But you can't tell me one person who hasn't had too much to drink and fallen over"

### Travel

This is a strong theme in Pete and Angela's life. They want to take risks and demonstrate that they too can do crazy things like anybody else. They want spontaneity in their lives, the freedom to take initiative and the choice to challenge themselves.

"We are a bit 'lairy'. We find that we do things that not everybody would do because they find it scary. But because we have had to overcome that sort of thing, we'll do it. We went on holiday one year. We just packed two rucksacks, went to

the train station and said, 'Where is the next train going to?' 'London'. So we got on the train and went to London, found a hotel, got bored there for a couple of days, so got back on the train. "Where is it going?", 'Bath'. So we went to London, Bath, Bristol Nottingham and Edinburgh. Just by getting on the next train. There are not many able bodied people who would do that because they would be scared."

Angela and Pete feel lucky in some ways because, like many disabled people not in regular employment, they have more time than many able-bodied people. Further, their relationship is strong because they have the same interests and like to do the same things. Their experience is that there are many activities which are unnecessarily complicated by a culture which encourages people to sue. Much could be done that would enable disabled people to participate without risk. Companies and their staff need to take account of risk but also to recognise when people can be accountable for their own behaviour. Flying is a real problem for Angela and Pete.

"We went to the airport. They wouldn't let us on the plane because we had no carer with us, so we had to stand there for about half an hour to persuade them that we could look after ourselves and we were fine. We didn't need anybody to help. This happened in both directions so clearly no communication had been passed between staff at each airport."

This inconsistency is aggravating. Travel is a particular source of frustration for many disabled people, and it is the planning which mitigates against spontaneity and even the ability to respond in an emergency like a family crisis. Angela does drive, and so, unlike many disabled people, she is not totally dependent upon an unreliable and inefficient public transport system capable of raising near-insurmountable difficulties for any number of the travelling public. This system requires disabled people to make unnecessarily elaborate arrangements for travel, so creating a far greater potential for things to go wrong than are faced by the ordinary passenger. For example, during the recent fireman's strike, the lifts at a certain station were put out of operation. As a result, a disabled passenger, simply to cross from

**They wouldn't let us on the plane because we had no carer with us**

one platform to the other, had to make a two-hour trip, diverting to a station where she could cross the line before returning to the one with the lifts.

To return to the particular experience of Angela and Pete, when they wanted to fly to Scotland they could not simply turn up at the airport and take a stand-by flight.

“We have got to book it weeks in advance and go through all the red tape and pay more money because basically, if you are on a stand-by flight, you pay about £10 and get on the plane. But we can’t do that. We are not allowed to.”

Travelling by rail is equally fraught with problems. Disabled people have to book 48 hours in advance on the train for the staff to ensure that the ramp is on the right platform. Angela has worked it out though.

“They mess up so often with these sort of things, if you go to the train station and tell them you have booked, they believe you, even if they find no proof that you have done it, because they mess up so often. And then all of a sudden, because they think you have booked, that piece of metal can go from that side of the platform to the other side very quickly.”

As Pete says, this is not about money. The avowed reason for having to book so far in advance is the need to ensure staff are available to assist. Angela and Pete would like to see another solution which would enable them to just get up and go more easily. As Angela says:

“I don’t see why we should know where we are going 48 hours in advance. If you knew us, you would know that we would never ever do anything 48 hours in advance. We went on holiday to Bahrain at three days’ notice. We don’t plan things, we just go. You don’t know what is going to happen tomorrow. It is not always about money, that is what we are trying to get across. It is about people having the bottle to let us do things. It is not about us having the bottle, it is about attitudes, about them letting us, treating us normally. We can do things.”

This is illustrated further by another experience:

"We went down to Herne Bay and parts of Herne Bay haven't got a path. So we walk on the road like everybody else does, but it is a huge drama for us to walk on the road unlike it is for someone else to walk on the road. We were told by a passer-by 'You can't go on the road – it's dangerous'. We were with a really good friend and people assumed that he looks after us – he's just a mate – and on seeing us walking in the road on this occasion, someone indicated he should do something about it. It was really quite funny because he is really cool. He wouldn't ever tell us what to do. Everyone else has to walk on the road because there is no pavement but it is alright for them."

Angela and Pete feel that disabled people are often made nervous by such attitudes.

"It is drummed into disabled people that you can't do this because it is daring or it is dangerous or scary. If that stopped, a lot more people would be a lot more independent."

This is because disabled people may have less direct experience of risk taking and trust the judgement of those around them who may truly believe they are acting in the person's best interests. So the situation can arise where someone does not depend on their own assessment of the risk, and as Angela says:

"Some disabled people are not scared to do the things that people tell them it is alright to do, they are happy to do them. They are not happy to do things that people tell them are daring or dangerous, whether this is valid or not."

This is not an unusual situation for people considered vulnerable by society, but it is a frustrating and limiting attitude which often produces solutions unwelcome to the people they are designed to assist. Non-disabled people feel they know best and have a greater awareness of the safety issues; this is not the case. When people live with their impairment day in, day out, they become expert in assessing the



problems and risks they face, and in taking account of both their own and others' well-being.

## Consultation

Consultation with disabled people can result in poor solutions, generally because of a lack of understanding about the nature of consultation. The house where Angela and Pete live was specially designed for occupation by disabled people. During the planning process a disabled person was approached for advice about what would be needed. He could walk. An assumption seems to have been made that simply having a disabled person involved would produce a solution suitable to all disabled people. The person involved was perceived as able to represent the needs of a broad range of disabled people, but clearly this is far from the case as the diversity of impairment is so great. Angela and Pete expressed concern at the way in which some disabled people are bestowed a label of expert, just because they are disabled, and that their views carry an exaggerated weight in the design and planning process. This is a real issue and a challenge to those who wish to genuinely consult on product and environmental design.

Some things do not make sense if you are a user. Angela and Pete have quite a lot of specialised equipment in their home. Some of this falls within the scope of inclusive products, some of it has been exclusively obtained through statutory agencies to help Pete and Angela to take care of their personal needs. Some responses seem to be extravagant and unnecessary. One example given by Angela relates to moving house. In her view:

"A lot of things are very silly things – all these curtains here are electric and the doors are electric. Now when we move, we are thinking of moving soon, we can't take any of this with us. It has all got to be put in new again. Once they move it, it is not guaranteed. Now to me that is daft. There is nothing wrong with it. If I lived in my own house and I bought it myself I would take it to my next house. The bath, everything, I would take it with us. Now a lot of it won't be practical for the next person so it will get ripped up and thrown away because it is specialised for Pete. So a lot of it will get taken out because the next person won't need it and we can't take it with us. To me that is a waste

of a lot of money because these things aren't cheap. "

She goes on:

"The next person, you can guarantee, will need a shower because most people do. He is odd because he only likes a bath. It cost £2000. So that bath will get ripped out and it was only put in four years ago, there is nothing wrong with it but we won't be able to take it with us. We will have to have another one put in because you can guarantee there won't be one in the next house. This seems such a waste of money to us."

The other part of this is that when the house move takes place:

"It will be all wait, wait. When we move to our next house, if it has not got the things, we will have to wait for the red tape, wait for them to say yes, wait for someone else to approve it, then wait for them to find an approved person to put it in, then wait for them to send them a quote, then wait for them to give us a date to put it in. Maybe a year later it might all be done. Whereas our friends would help us pull all this out and put it back in the next house. Job done – two minutes. But you can't do it. There is just no logic in these people sometimes. I can guarantee this stuff is going to be no good to the next person so it is going to come straight out – everyone is different and there is nothing wrong with it."



## Product design

Finally the discussion moved on to particular products which were difficult to use. Pete does not have much dexterity or strength in his hands, and he immediately identified can openers and the phone as particularly difficult. Pete is unable to hold a phone and he finds the quality of hands-free products very poor. He has similar problems with remote controllers, a solution often offered to people with mobility problems in order to operate a whole range of electrical equipment. Pete needs to have the controllers flat on a table, but they slide about and also require to be programmed within a short time span, as Angela explains on his behalf:

If you ask for a hire car that takes a wheelchair in America, it comes with hand controls as standard

"We have Sky, and to access some of the channels. You have to put three, three, three, say, and you've got about half a second to get the 333 in and Pete is not quick enough. So he will press the three and go to put a six in and by the time he has got his finger from the three to the six, it has gone again so it is stuck. Things like that are frustrating."

A further source of irritation is the design of toilets.

"The flusher is always on the wrong side. You have always got a big gap on one side in a disabled toilet and a small gap on the other and you can guarantee the flusher is on the small side. So you have either got to flush the loo while you are on it and get a wet bum, or leave it."

Sometimes the solution, which a great deal of thought has produced, creates yet more problems. For instance many public accessible toilets can only be accessed through the use of a special key purchased from RADAR, a national disability organisation. Pete is unable to hold or turn the key so disabled people can't open the door. Angela would like a very different approach which would entail all toilets being rather better designed, and then:

"We can all wait our turn. We don't mind waiting our turn."

Pete and Angela feel that insufficient thought is put into the design of shops and other service providers such as banks. Electric doors would make an enormous difference to their ability to get out and about in town without constantly requesting help from strangers. Often this means waiting outside until someone is willing to help; an uncomfortable and embarrassing situation."

Changing rooms in clothes shops are always too small if help is required. These are usually segregated too, so this can create problems if a shop is reluctant to allow their customers to take items home and return them if they are unsuitable. The DDA 1995 requires shops to make reasonable provision for their disabled customers and an inclusive approach to changing room facilities would take them towards that goal.

## Hire cars

Pete would like to see adapted hire cars. He believes this happens in America and is sure there would be a market here. As Angela says:

“If my car breaks down, I am entitled to a courtesy car which I can’t drive. I can have the car, I can sit and look at it outside of my house until my car is fixed. But I can’t drive it.”

He has been impressed by their experience of hiring a car in Pittsburgh whilst on holiday. Once again the discussion returns to travel, and Pete and Angela’s experiences which seem to be key to their sense of independence. Angela recounts:

“If you ask for a hire car that takes a wheelchair in America, it comes with hand controls as standard. The basic hand controls are enough and people who need more than that probably wouldn’t try and hire a car anyway. But there are a lot of people who need the standard hand controls that could do with hiring a car.”

This is about an aspect of inclusive provision. Angela uses standard hand controls in her car and anyone else can drive her car so long as they can drive an automatic model. This can be achieved without dismantling or changing anything. Some hire cars can be altered between manual and automatic operation, as standard now, such as a Vauxhall Corsa, so that the inclusion of hand controls may not be far off. Angela is clear:

“They wouldn’t have to just hire it out to disabled people, they could hire it out to anybody and just leave it because it doesn’t get in the way, it is not annoying, it is just a small bar with a handle on it. Their excuse is ‘we wouldn’t get enough customers to use it’, but they don’t need to just aim it at disabled people. They could hire it out to anybody and provide courtesy cars when disabled people need them.”



You have got to ask for it, which is a bit unfair. It makes you feel as if you are very pushy sometimes

## Hotels

Angela and Pete are impressed with some hotel chains that have really tried to be inclusive in their design policies. They stick to the same ones because they know they are all built to the same standard.

“They have all got disabled access. Every single one in the country has disabled access. The only thing they could do with changing is their bathrooms – they could do with bath chairs in the baths so that we could actually use the bathrooms. And make them big enough to get in them – half of these baths, I couldn’t get Pete in because I need one of those special baths. I think they are pretty easy to put in because anybody with a disability could use them because they are electric, they are not physically hard to use because they are electric. It raises you up and puts you in the bath, there is no hoist or anything like that.”

This could be an advantage for many people, people with a temporary incapacity, such as older people, and would not inconvenience anyone. Angela points out that:

“Once they are in, they are in. They take a bit of maintenance, fair enough, but the one they have has never broken down really badly. A little bit of money, maybe, to keep them maintained but they could buck up the price of the hotel room a little bit. That would cover it.”

In conclusion, Angela and Pete observe that inclusion is not just about money.

“If people changed the way they think, they could change the way they spend the money. There is no point in having the money if they don’t have the right ideas to go with it. All the money in the world – if you don’t know what to do with it, it is no good for you.”

They are articulate and well able to request that their views be heard.

“We’ll ask for it. We are not shy, when we want something, we will go and ask for it. Then they think, she might have a point

and need that –people rarely take the initiative and come to us.”

This does not help with getting things right for disabled people.

“Most disabled people they aren’t getting what they can get because they are quiet.”

Angela ended the interview by saying:

“You have got to ask for it, which is a bit unfair. It makes you feel as if you are very pushy sometimes.”

### Changing perspectives

Angela and Pete aptly demonstrate, that independence for them is closely linked to a reciprocal and mutual relationship with others, in which respect for their individuality is a key component. Compromise is part of their daily experience, but on their terms. The challenge for those involved in commissioning and designing products and services is to change the traditional idea that the role for disabled people is that of a recipient. This means seeking out their contribution, right from the start of projects, and listening with an open mind to what they have to say. Society, by its very nature, fosters a mutual dependency upon strangers, who provide our food, power etc, and upon family and friends who may do all sorts of tasks for us (Johnson, 1993).

Angela and Pete’s dependency on reliable and responsive services and products is little different from anyone else’s. The attitudinal barrier however is immense and precludes significant numbers of people from participation in many ordinary, mainstream activities because of the assumptions made about their wishes and expectations.



Thanks to Angela and Peter Zein for the use of their personal photographs and the time they gave to the research.

### Further reading

- Johnson M (1993)** Ageing in Society: an introduction to social gerontology. Sage Publications, London
- Murray P (2002)** Hello! Are you listening? Disabled teenagers’ experience of access to inclusive leisure. Joseph Rowntree Foundation, York
- RITE project** [www.darefoundation.org](http://www.darefoundation.org)

## Chapter 5

# Design exclusion

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While inclusive design and universal design are commonly accepted as good design aims, this chapter discusses the merits of focusing on design exclusion. The concept of design exclusion is particularly powerful because identifying why and how end-users cannot use a product enables us to counter such exclusion. This chapter explains how design exclusion arises and defines a series of measures of inclusive merit – i.e. how successful products are at being inclusive. The themes of quantifying and countering design exclusion are re-visited in later chapters in this book.

It is known that many products are not accessible to large sections of the population. Designers instinctively focus on providing the necessary utility (functionality) for someone with physical and skill capabilities similar to their own (Cooper, 1999), unless specifically instructed to do otherwise. They are either unaware of the needs of users with different capabilities, or do not know how to accommodate their needs into the design cycle.

One of the key steps to ensuring that designs are as genuinely inclusive as possible is to provide metrics for defining the level of inclusivity attained throughout the design process. By providing suitable metrics, designers should be able to measure the success of their designs and also identify accessibility shortcomings. The aim of this chapter is to discuss possible metrics for measuring the inclusivity of a design and to present a tool for the graphical representation of the population included by a design compared with the population excluded.

The motivations for wanting to design for a wider range of user capabilities and avoid unnecessary exclusion are easily identified. The demographic change to an aged population distribution in the developed countries is marked. Studies show that by 2021, half the adult population in the UK will be over 50 (Coleman, 1993). Ageing also brings increasing divergence in physical capabilities (Coy, Keates and Clarkson, 2001), so it will become increasingly necessary for products to support a wider range of physical capabilities. There is also a legal imperative for designing for the widest possible population, from legislation such as the UK 1995 Disability Discrimination Act (DDA, 1995), the US 1990 Americans with Disabilities Act (ADA, 1990) and Section 508 of the US 1998 Workforce Investment Act (WIA, 1998). However, in spite of the motivations for the adoption of more inclusive design practices, industry has been slow to do so.

Many products were developed with no thought of whether someone would actually want to use, or be seen using, them

## Design exclusion and inclusive design

According to Nielsen (1993) system acceptability is the goal that designers should be aiming for and can be achieved by meeting the social and practical acceptability objectives for the system. Nielsen further identifies usefulness, constituting usability and utility, as a key objective to providing practical acceptability.

Most designers focus on providing the necessary utility, or functionality, of the system required for the task, and the social acceptability, such as the aesthetic characteristics, for users who match their own capabilities and taste. There are two reasons for this. The first is that these are indisputably very important objectives. The second is that a minimally effective solution can be obtained in the minimum of time.

However, as numerous usability texts attest (e.g. Nielsen, 1993), such minimally effective solutions are increasingly unacceptable to the wider population. They argue that usability, i.e. the ability to use the utility, is also important and needs to be designed directly into the system. In principle, usability techniques should be address the needs of the whole population. However, in practice, they still generally assume the same, able-bodied physical capabilities of the users.

Consequently, accessibility design approaches have had to be developed to complement usability approaches. These approaches are variably referred to as 'design for all', 'universal access' and 'inclusive design' and are broadly variations on 'user-centred design'.

## Existing approaches to inclusive design

There are several existing approaches to designing more inclusive products. However, there are shortcomings of each of these approaches that prevent them from being applied in all circumstances. The principal weaknesses stem from the targeted nature of the approaches.

Initially it was recognised that the disabled and elderly were the principal groups excluded from using most products. The solution appeared obvious - if such users could not use the products, then developing special products designed specially for them would solve the problem. Thus concepts such as 'design for disability' appeared.

While many good products were developed, they were outnumbered by those that were either expensive, inappropriate, or simply did not offer the necessary utility. The focus of the products was often on very specific needs arising from very specific circumstances.

Also, many of the products had to be designed from scratch. This made for very long development times, with resultant high costs.

Frequently, the time that should have been devoted to improving the usability was spent on technical development (Buhler, 1998). In many cases, usability was often overlooked completely. The situation became so bad that many rehabilitation robotics products, for example, failed to even sell more than 10 units (Mahoney, 1997).

In parallel with the lack of attention paid to usability issues, the social acceptability of the products was often overlooked as well. Many products were developed with no thought of whether someone would actually want to use, or be seen using, them. As people rebelled against using ugly, stigmatising, expensive and unusable products, it was clear that new approaches to design were required.

A number of new design approaches were developed to overcome the shortcomings of the earlier methods. However, these newer approaches have their own shortcomings, for example often being targeted only at specific population groups or impairment types. For example, transgenerational design (Pirkle, 1993) focuses on design for older adults, while rehabilitation design focuses on specific impairment types (Hewer et al., 1995).

Design approaches can also be culture-related. For instance, universal design (Bowe, 2000) dominates US, Japanese and Australian approaches to inclusive design, whereas Europe has generally tended to develop other methods, such as the User Pyramid Approach (Benktzon, 1993).

In addition, the prescribed methods of application of the existing approaches are often vague. For example, universal design is more of an ethos than a rigorous, systematic design approach. There are very few structured descriptions of the implementation of universal design in more detail than broad design objectives (Bowe, 2000). Consequently, while a combination of the existing approaches may offer complete coverage of the population needs, individually they do not.

Having discussed that the existing approaches to design for all tend to cater for specific circumstances or populations, it would be helpful if guidance could be provided to designers to identify which approaches focus on which sectors of the population. Further investigation reveals that the different approaches to designing for the wider population fall into three fundamental categories:

- user-aware design – pushing the boundaries of ‘mainstream’ products to include as many people as possible;
- customisable/modular design – design to minimise the difficulties of adaptation to particular users;
- special purpose design – design for specific users with very particular needs.

### 5.1 The inclusive design cube

Mapping design approaches to the whole population using the inclusive design cube.

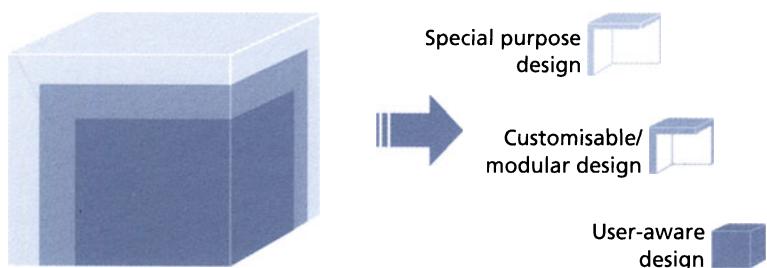


Figure 5.1 shows the how these approaches can be combined to provide complete population coverage. The cube representation of the whole population will be used throughout this chapter, and will be referred to as the ‘Inclusive Design Cube’ (IDC). It was recognised that the principles of user-aware design generate products that are widely accessible to the population and hence offer good population coverage. Consequently, this approach dominates the cube. For severely impaired users, it may be necessary to adopt rehabilitation design approaches of custom products for specific users, special purpose design in Figure 5.1.

In between the two approaches is an intermediary design approach with flexible boundaries. Customisable/modular design takes a base unit designed using the user-aware design principles, but with a changeable interface that is either adaptable or can be swapped for one of a series of modular designs.

### The need to address exclusion

As can be seen from Figure 5.1, not only does the IDC show who is included by each design approach, but also who is excluded and, most importantly, begins to address the issues of why people are excluded. This is an extremely important concept. While it is useful to know who and how many people can use a particular product, that information will not provide guidance on how to make the product accessible to more. However, knowing who and how many people cannot use the product immediately highlights the aspects of the product that need to be

improved. For example, if a product excludes a significant proportion of the population because of the perceptual demands, this is because users either cannot hear or see the output from the product.

Many of the existing approaches to inclusive design and design for all are focused on making products and services more accessible by extending the initial concept of the end-user to include a wider range of users. While this is an excellent starting point, the success of the resultant design is highly dependent upon the choice of the end-users at the outset. If the end-user selection is very specific, then the needs of those users should be well catered for. However, the overall ability of the final product to meet the needs of different end-user groups may be compromised, if the design is tailored too closely to the specified end-user group.

For example, consider the design of a computer input device that filters out tremor. Tremor can arise from a number of medical conditions, as a result of the ageing process, or from external environmental factors such as movements from being on a train. Tailoring the input filters to assist users with just one condition such as ataxic cerebral palsy, may inadvertently limit their usefulness for end-users with Parkinson's Disease, say. Therefore, it is best to consider the needs of all users with similar conditions during the design process. This can be achieved by careful consideration of all possible end-user groups at the outset of the design process. However, there is an alternative approach of identifying and countering design exclusion.

The underlying principle of design exclusion is that by identifying the capability demands placed upon the user by the features of the product, it is possible to establish the end-users who cannot use the product irrespective of the cause of their functional impairment. Consequently, by re-designing the product to lessen the capability demand, users from a wide range of end-user groups can potentially be included and no-one is excluded unnecessarily by considering one cause to the detriment of others. The concept of addressing exclusion is supported by Alexander's notion of 'bad fit' (1964):

When we speak of bad fit we refer to a single identifiable property of an ensemble, which is immediate in experience, and describable. Where an instance of misfit occurs in an ensemble, we are able to point specifically at what fails and describe it.

To support the concept of countering design exclusion, it is necessary to consider methods of assessing the features of a product and users' interaction with it to establish the capability demands placed upon the end-users. Those demands can be translated into numbers of people unable to use the product and as such provide a basis for measuring the success of the design with respect to levels of inclusion. The process of identifying the level of capability demanded by particular features and the consequent population exclusion also provides a basis for prioritising the re-design effort to correct the features that cause the most exclusion. A working definition of inclusive design can thus be proposed.

### A working definition of inclusive design

Design typically involves the creation of solutions and then a review to ensure that the design criteria are met. At the lowest level a design review process could involve a simple check to ensure that the resultant product offers the necessary functionality. At higher levels of sophistication, though, evaluations of increasingly less quantifiable measures are required. The measures can range from whether the product is usable or accessible, through to the outright qualitative, such as whether it is aesthetically pleasing and socially acceptable. Consequently, when developing a design approach for inclusivity it is necessary to consider the measure of success, i.e. the point at which the design is considered to have met the stipulated requirements. This shall be referred to as the inclusive merit of the product.

There are two distinct approaches to defining the requirements of interaction for inclusive design: product-centred and user-centred. The traditional view of designers has been the former approach, to specify the functional and/or aesthetic properties of the product. The design of the interface then places functional demands on the user that the user must be able to meet or else be excluded from using the product. User-centred design practices, however, put the emphasis on the user capabilities, wants and needs, driving the process in the other direction.

These approaches have led to the two principal strategies for the development of an interface for different user capabilities. The first is to take the existing interface and then tailor it retrospectively to different users. The second is to change the definition of the user at the very outset of the design process to include a wider range of capabilities.

These approaches can be described as ‘reactive’ and ‘proactive’ respectively (Stephanidis, 2001).

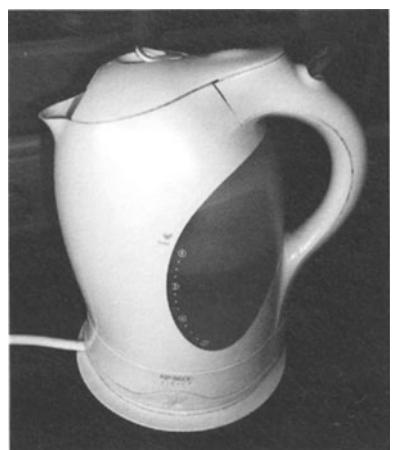
The stipulated requirements of the product have the potential to exclude certain sections of the population who cannot meet the necessary functional capabilities. As an example, consider a kettle that must boil a minimum volume of water and therefore has a minimum associated weight from the water inside it. Therefore, users of the kettle will be required to have enough strength to move that minimum weight. Anyone not meeting that strength requirement will not be able to use the kettle, irrespective of other design decisions made or product requirements stipulated. The recognition of fixed limits on the target user population set by the stipulated application requirements leads to a possible working definition of an inclusive design:

*An inclusively designed product should only exclude the end-users who the product requirements exclude.*

The corollary of this is, of course, that the design fails to be inclusive if people are excluded from using the product even though they possess the functional capabilities to meet the demands of the idealised design based on the requirements. This implies that the designers have introduced new capability demands on the users that are not essential attributes of the product, but resultant from the designer's decisions.

The principle that only those who the product requirements exclude should be excluded by the product therefore provides the basis of a metric for measuring whether a design solution is sufficiently inclusive. However, this raises an issue that needs to be addressed at the strategic level of the design management, that of where the stipulated requirements should be set. Taking the example of the kettle, how much water should it hold? A smaller capacity decreases weight and increases inclusivity, but the marketability probably decreases. A managerial decision is therefore required between marketability of the product and the level of population exclusion, and consequent potential market size.

In summary, one possible measure of inclusive merit of a product depends on two criteria: the merit of the requirements that define it; and its merit when judged against those requirements. However, such a definition is focused on only two population definitions. In practice there are a number of possible populations that can be considered.



## Defining the target populations

The most logical place to begin is defining the terminology for the global/geographical population being considered, i.e. the absolute maximum number of people who could use the product. This is referred to as the *whole population* and it includes all people of all ages and capabilities.

The target population is often equated to the whole population for a product. However, that is a very simplistic view. In reality, there will be certain limits on the number of people who may wish to use the product. For instance, legislative or safety requirements forbid people from using certain products, such as under 17s being forbidden from driving cars in the UK.

Another group that may be excluded are those who, even under the most optimistic assessment, would be incapable of using the product for its intended purpose. This assessment should be completely solution-neutral. An example would be if the requirement was 'to produce a product for making hot drinks'. The exclusions under this requirement would be:

- motor capability – unable to lift/manipulate any cup-size container of hot liquid;
- cognitive capability – unable to understand how to handle any cup-size container of hot liquid safely;
- sensory capability – unable to distinguish correct cup-size container from other objects.

The resulting population following the removal of those who are prevented by law, safety considerations and irremediable lack of capability from using the product, shall be referred to as the *ideal population*. This is the maximum population by which a product could possibly be used under ideal conditions.

Within this ideal population sits the product itself and its requirements. Looking first at the product, as soon as anything physically tangible is produced, it can be assessed. This means that at any stage from initial concept through to the final design solution, the inclusivity of the product can be evaluated from the physical properties of its prototype. The people who could actually use the product, based on its physical properties, are referred to as the *included population*.

Sitting between the included and ideal populations is another population that reflects the product requirements. Under ideal conditions, if standard engineering practice is adopted, each new product will first be defined by a specification or set of requirements, before any product concepts are developed. This can be thought of as the requirements population. However, this definition is problematic because it is hard to define a particular stage of the product design cycle where the requirements are fixed and do not alter, short of the final product itself.

Consequently, explicit definitions of a requirements population are very difficult to specify. However, the concept of capturing something other than the included population is important. Therefore, we need to specify a population where it is acknowledged that the population will change, based on how the requirements develop and evolve. This is referred to as the *negotiable maximum population*. ‘Negotiable’ implies that this population is not fixed and can change as the requirements change. It is the ‘maximum’ because by definition the inclusivity of the product cannot exceed that of the requirements specification.

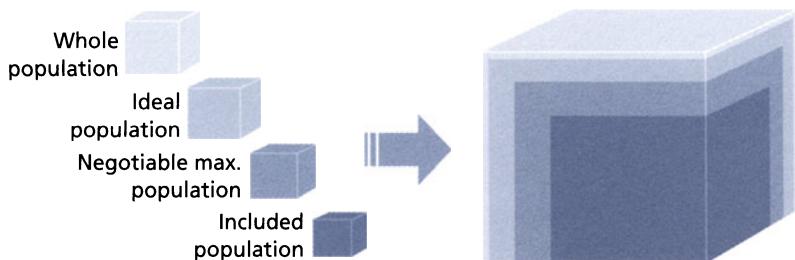
This is not immediately obvious, but arises from the difference between the likely method of assessing the requirements specification and that of assessing the product. Any assessment of the requirements is likely to focus on the individual components in isolation, because the interaction between elements will be unknown and consequently unquantifiable. This can be thought of as an idealised assessment of the best possible product to meet those requirements. In practice, though, any attempt to design an actual product to those requirements will inevitable involve some trade-offs that will reduce the inclusivity of the product.

These populations can be mapped onto the inclusive design cube representation (introduced in Figure 5.1), as shown in Figure 5.2.

At no point in the above definitions is the ‘target’ population referred to, because there are so many options to which it can be mapped. For example, the whole population is the utopian target solution, the ideal population is the best that can be achieved and the negotiable maximum may be what a product designer is happy to reach. Consequently the concept of a target population is difficult to specify without a clear definition of who is defining the ‘target’ population and what the definition is.

## 5.2 The inclusive design cube

Mapping the WINIT scales to the whole population



One possible ‘target’ population that may be of interest is the *intended (sales) target population*. We can add this to the above WINIT categorisation, but with caution because it is an arbitrary definition, dependent upon the choices of the company management. For example, it could be particular age groups such as the over 75s, or particular marketing stereotypes.

To summarise the defined WINIT populations:

- Whole population – everyone
- Ideal population – the maximum achievable
- Negotiable max population – everyone included by the specification
- Included population – those who can actually use the product
- Target population – those who were intended to use the product

## Defining measures of inclusive merit

Having defined the different types of populations being considered, it is possible to enumerate the ratios between them. These can be used as measures of the inclusive merit of the product.

The ratio between the whole and ideal populations gives an indication of the level of exclusion associated with the concept task, irrespective of the solutions developed. Changing the positioning of the product being considered, so that it is subject to different health and safety regulations or different legislation, is the only option for changing this ratio. The ratio between the negotiated maximum and ideal populations reflects the level of exclusion that has been generated by the refinement of the product requirements.

The ratio between the included and negotiable maximum populations indicates the level of exclusion generated by the particular configuration of the product at that point in time. As the design progresses and the requirements are refined more explicitly, this ratio should approach unity.

The ratio between the included and ideal populations is probably the most important as it provides a direct comparison of how good the product is at the moment compared to its theoretical maximum.

Finally, the ratio between the included and intended populations shows how successfully the product reaches the intended sales target population, while the ratio between the negotiable maximum and intended populations shows the success of the product requirements in meeting that same target population.

### A new model for supporting inclusive design

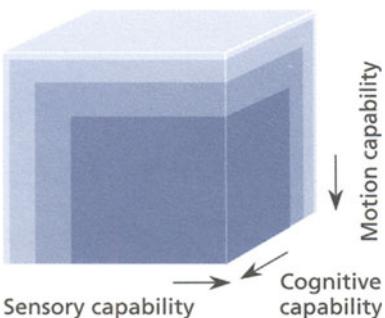
As discussed earlier in this chapter, it is helpful to offer designers methods of explicitly evaluating the success in terms of inclusivity of their development prototypes and designs. A three-dimensional visual representation of how the three fundamental design approaches was shown in Figure 5.1 mapping those approaches to the whole population.

Developing the concept of evaluating exclusion, metrics of inclusive merit were proposed for enumerating the success of current design and also design requirements against the best-case solutions. These metrics could again be mapped onto a three-dimensional representation of the whole population. The population could be represented by almost any shape, whether a circle, square or pyramid, for example and the design approach shown as a sub-region of that shape. However, while such a representation would show how many people were included by a particular approach, it would not offer much information beyond that.

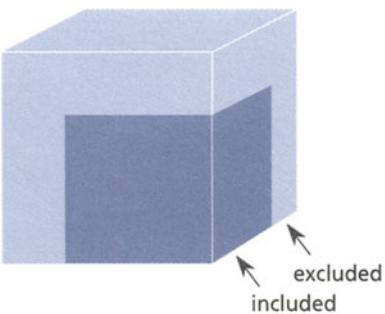
A more attractive proposition would be to replace the arbitrary shape with one that represented features of the population that would be of use to a designer. Such methods of dividing the population could be along lines of gender or age, for example, but although such partitioning of the population is useful for marketing purposes, it is not necessarily helpful for designers. An alternative partitioning is suggested by studying the nature of human-product interaction.

### The inclusive design cube

The division of human-product interaction into three distinct stages - perception, cognition and motor functions (Card, Moran and Newell, 1983) - suggests a method for dividing the population according to the ability to perform those functions. Applying equal weight

**5.3 The inclusive design cube**

Mapping capabilities to the whole population.

**5.4 Design exclusion**

The inclusive design cube showing product inclusion and exclusion.

to the capability to perform each of these actions implies a cubic representation of the population. Design approaches can then be represented according to which level of capability they address.

Building on the concept of the user pyramid (Benktzon, 1993) with its banding of users by impairment level, the authors have developed a model that relates capability level, population profile and design approaches in a simple graphical format. The resultant model, the inclusive design cube (IDC) (Keates et al., 2000), is shown in Figure 5.3. Each axis on the cube represents user capability and the enclosed volumes reflect population coverage.

The resultant inclusive design cube is a very potent visualisation tool and communicates the needs of different sections of the population.

### The IDC and exclusion

Presenting design exclusion by employing visual representations, such as the Inclusive design cube, allows the succinct communication of the levels of exclusion to the designers and design commissioners thereby enabling rapid review of the success of the current state of the design.

As can be seen from Figure 5.4, not only can the IDC show who is included by each design approach, but also who is excluded and, most importantly, begins to raise the issues of why people are excluded.

As discussed earlier, this is an extremely important concept. While it is useful to know who and how many people can use a particular product, that information will not provide guidance on how to include more. However, knowing who and how many cannot use the product immediately highlights the aspects of the product that need to be improved. For example, if a product excludes a significant proportion of the population because of the perceptual demands, this implies that users either cannot hear or see the output from the product.

The cube also begins to raise interesting issues, such as whether it is possible to compare one population with another, and consequently how one might define population types and describe exclusion.

By using a consistent representation, a tool has been developed for understanding the effectiveness of many factors relevant to inclusive design. In this chapter, populations, inclusive merit and design approaches have all been mapped onto the inclusive design cube.

## Summary

In summary, this chapter has presented a powerful graphical tool, the inclusive design cube, that can be used to represent not only the level of population included, but also how many people are excluded. By developing the WINIT concept of different populations, it is possible to measure the inclusive merit of the design.

Such a tool also offers indications of how new design approaches can be developed based on an understanding of the elements of interaction. However, before such models can be applied widely, it is necessary to address the issues of assessment and quantification of the levels of capability required to use a design. The themes of quantifying and countering design exclusion are re-visited in later chapters in this book.

## Acknowledgements

Title page photograph by Julia Cassim.

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## Chapter 6

# Power to the people

**David Yelding**

Research Institute for Consumer Affairs (Ricability)

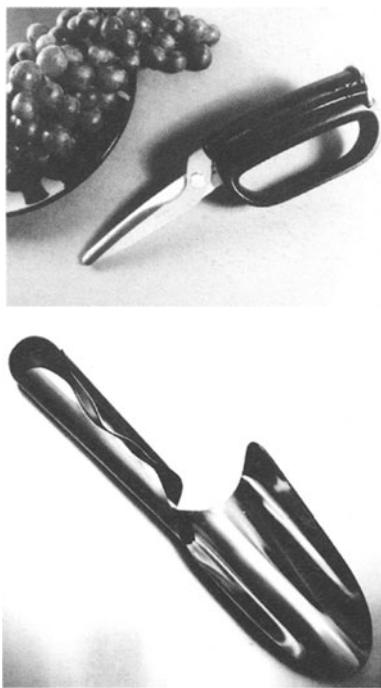


In this chapter we look at design from a consumer point of view. It describes testing carried out by consumer organisations and some of the practicalities involved in assessing products from the point of view of disabled people. Some of the findings of this research are reviewed. It suggests that few mainstream products are designed to cater for older and disabled people and that very few cater for the range of impairments frequently found in the population. Much of this problem is due to simple ignorance of what is needed. This is partly due to a lack of teaching in design colleges. Closer collaboration is needed between those who evaluate the design of products and those who are responsible for this design. Recommendations include the need for a cultural change within certain industries, the consolidation of information about the inclusive design, and more creative thinking all round.

It is the consumer who bears the brunt of poor design, who may be irritated or inconvenienced by ill-thought-out products or badly-designed environments every day. It is the consumer who has to adapt to poor design and negotiate a way round it. So design should, by right, be a major consumer issue. Yet the links between designers and older consumers appear to be tenuous and design is something that they have had little influence on. The mechanisms for influencing it are few and not particularly effective.

This imbalance has needed redressing for some time. However this has become more urgent as the age profile of our society has changed. Other chapters in this book describe in detail the demographic developments which have led to the recognition of ourselves as a more diverse society in which the balance between the old and young has fundamentally and permanently changed. Not least, there has been the growing and overdue recognition that old age is a predictable, normal part of our lives which needs catering for. This is particularly important as most of us can expect to experience the frailties of age for a much longer time than any previous generation.

Yet, for the most part, product design has not reflected these changes. In this chapter we look at the ways in which the research carried out by consumer organisations can contribute information to help accelerate the pace of change.



Good Grips kitchen and garden tools.

## Consumer organisations

For over 50 years, consumer organisations world wide have painstakingly exposed the comparative merits of the products they test. They have been effective in improving standards because their information has been reliable, has led to discriminating choice and has powered a number of campaigns, particularly on safety. While they have largely kept away from commenting on the aesthetics of design, they have increasingly commented on functional design and on the ergonomics of everyday products. As the technical performance of products has improved and major performance differences between brands has diminished, assessments of ease of use have become a more important element in consumer choice.

Ricability (the Research Institute for Consumer Affairs) was set up some 40 years ago by the Consumers' Association, publishers of Which?, to investigate a wide range of consumer issues. Latterly it has specialised in research for older and disabled people and is now an independent charity. Like other consumer organisations its ultimate objective is to improve products and services. It does this mainly by publishing information based on original research. It differs from most other consumer organisations in that it does not sell its information to subscribers to a magazine but provides it free, reflecting its target audience who are more likely to be disadvantaged. Although it uses standard research techniques, its application is focused on people who, between them, have a diverse range of impairments. We argue below that it is research among these groups that will lead to truly inclusive design – products that can be used by a wider range of people and which are easier for everybody to use, able-bodied or not. Below we explain how these tests are carried out and discuss what they have revealed about design and disability.

## User based tests

All Ricability's assessments are ultimately based on user tests. As far as mainstream (as opposed to assistive) equipment is concerned, over the past few years we have assessed over two hundred domestic appliances – washing machines, tumble driers, kettles, toasters, vacuum cleaners and irons – as well as a wide range of other products including telephones and cars. We are a year in to a three year programme of childcare equipment, assessed from the point of view of disabled parents.

Our tests are different from those used by designers and by manufacturers as part of their R&D programmes in that they start from the opposite end, with finished products. And, because they are geared to provide information to help individual consumers choose products, they are usually comparative. Our ratings for ease of use are therefore not based on a series of reiterative studies of a developing design, but are based both on what user tests reveal about the relative performance of products on the market, and also on deliberations about thresholds of acceptability, based on tests, discussions and observations of users. Other constraints for us are speed – there is little merit in publishing information on products which have been superseded – and the necessity of producing data which is robust enough to stand up in a libel court, if challenged.

There are several stages to the design of our tests. The first often consists of a qualitative investigation of how products are actually used by different consumers. These can be expert panels, focus groups or larger scale surveys. Broadly these are intended to find out more about the circumstances in which products are used, what is difficult or easy about them, what other equipment they are used with and details of any strategies people with different impairments have developed to get round design flaws. The consumer agenda may not correspond to the manufacturer's or designer's idea of how products are used. For example if we were testing cars we might see how easy it is to take off the door pocket (to allow room for people with stiff legs to swing them in) or how likely the door hinges are to stand up to people getting to a standing position by pushing on the sill. Similarly we know that some people hold onto a cooker for support when cooking, which has implications for its stability and surface temperatures.



## Choosing products

We very rarely have sufficient funding to test every model of a given product. Although we usually endeavour to include the brand leaders, strategies for selection include choosing products from a particular price range, testing expensive against cheap, testing those which a preliminary inspection suggests may have useful features for disabled or older people, and choosing products which between them have all the features we wish to examine.

**Very few of the mainstream products we have tested have been designed with older people in mind**

All these approaches have advantages and disadvantages. Whichever strategy is chosen, detailed preliminary market research is needed to ensure that the choice of test samples fairly represents the characteristics we need to represent. This research in itself provides useful information about market niches, and on the characteristics of consumers manufacturers have chosen to cater for.

### **Users**

There are particular problems associated with carrying out assessments which will be useful for disabled people. The first is the obvious one that there is no standard for disability which can be used as a benchmark. The severity of any particular impairment varies considerably, affects people in different ways and may change from day to day. What individuals are able to do also depends on motivation, and to some extent on their determination and ingenuity. For comparative tests it is also necessary for us to have a sufficiently large sample of users to produce statistically significant results. In practical terms this means that we usually need at least twelve people with each impairment we aim to produce information about.

Depending on the product being tested we may enlist the help of people who have impaired strength, dexterity, cognition, vision, hearing and mobility. Increasingly our tests take account of the needs of people who have combinations of disabilities including those who are generally frail. It follows that we usually need to recruit at least 50 people for each test, a number which increases incrementally if the number of products tested means that each user will only assess a proportion of them. Before we can draw conclusions for any disability group, we carry out an analysis about the variation of results by that group. The more diverse the group, the more careful we have to be about drawing conclusions.

### **Organisation of tests**

Tests can be carried out in a laboratory or in the environment where they are used. Laboratory tests have the advantage of being more controllable and it is relatively easy to ensure that each product is tested in identical conditions. Tests can be observed, and information checked for clarity as it is provided. However the testing environment is an artificial one, and where the interaction between a domestic

environment and the product is needed, trials are carried out in users' homes. This is particularly important if products are normally used for a longer period or in a different way than would be practical to replicate in a laboratory. The order in which products are tested is randomised and controlled between users to eliminate bias. Where a product is unfamiliar a period of pre-test familiarisation is built into the statistical design.

## Checklists

Funding rarely allows us to continue to carry out user tests in order to update our information in pace with the market. To make this more feasible we have pioneered a system of checklist assessments.

These are carried out by three assessors. Typically they would include a disabled person with a wide experience of the range of disabilities, an ergonomist and a RICA researcher. Each assessor makes an assessment of each product separately and records detailed reasons for this judgement, and any differences are reconciled in an adjudication discussion at the end of this process.

A pilot investigation showed that this technique would produce consistent and replicable results providing four main conditions have been met (Etchell, 1999). These are that the assessment document is based on tests in which an adequate number of participants with each of the disabilities to be covered took part, that the original user test covered the range of features and designs available on the products to be assessed and that assessors are properly trained in the implications of each type of impairment and, detailed guidance is provided by the assessment document.

## Findings

Irrespective of the type of product we have assessed, our overall conclusions have been similar, and have so far been somewhat discouraging. These are:

- Very few of the mainstream products we have tested have been designed with older people in mind and even less have the needs of disabled people been taken into account.
- Many design faults would be simple to rectify, at least if inclusivity had been built into the design objectives from the beginning.  
Products which by their very nature exclude some people (e.g. the

### The ten commonly found failings revealed by our research:

- Small print on labels; often pale grey on white
- Rotary knobs with smooth sides
- Small controls which require good dexterity to grip
- Instructions in small print with poor colour contrast
- Lack of tactile feedback, which mean controls cannot be used by feel
- Controls which require too much force
- Poorly lit, small readout panels
- Multi function controls on electronic devices
- Complicated menu systems
- Tasks which require the use of two hands

need for mobile phones to be small) require lateral thought or the better application of newer technology. And there is some conflict (for example in the packaging of medicines, safety locks on tumble driers) between the need to make things easy to use and protect children against accidents.

- There have been good examples of accessible design in each product group we have assessed. However these seem to be the result of chance than design. We commonly find easy and hard to use features side by side on the same appliance.
- Products which happen to be easy to use for one disability group are hard for others. We have only very rarely found products we can recommend as being even reasonably accessible across a range of impairments.

We have concluded from this and from discussions with manufacturers and designers that many of these shortcomings are due to simple ignorance. Inclusive design is not generally part of the syllabus of the undergraduate courses offered by design colleges. At the end of a presentation given at one prestigious school of design a third year student claimed that this was the first time usability of products had been discussed during his studies. Four years ago Ricability set up a small campaigning group to encourage more accessible design of cars. Generally neither manufacturers or designers were interested enough to attend a conference on the subject, and subsequent discussions with manufacturers suggested that demographic changes was seen as a marketing rather than a design opportunity.

Although nearly all R&D projects involve some consumers, older and disabled people tend to be involved at the periphery of any consultation, if they are involved at all. In some cases a small number of older or disabled people have been added at the end of the consultative process with the result that the information they provide has been attenuated and too late. There have been many instances of focus groups which have included older consumers. However their opinions have sometimes been eclipsed by younger participants and (given the propensity of older people to blame themselves rather than poor design) their opinions have not been widely heeded. We would argue that the conventional method of carrying out research needs to be inverted. Development work should concentrate on those who have the

most difficulty rather than on the able bodied majority. It is a truism that designing for disabled people makes products easier to use for everybody else.

In 2001 the Disability Rights Commission published a booklet (DRC, 2001) researched and written by Ricability on inclusive design. It looked at why some designs were limited and examined some of the possible remedies. Among other contributory causes were misunderstandings about the nature of inclusive design. Some thought that it meant that products had to be designed to meet the needs of every conceivable person, whatever their abilities – an unachievable target which had rightly been given short shrift. There were also largely unsubstantiated beliefs that product development which took into account the needs of a wider range of people would be difficult, expensive and inconclusive. Some designers feared that more stringent requirements would inhibit creativity or result in uniform products without distinction. There is also a little-admitted belief that designing for older or disabled people is an unsexy backwater.

However these views have been confounded by successful commercial examples where inclusive design has led to successful and attractive products. For example, Morphy Richards developed a coffee maker with chunky, easy to grip controls. Mira carried out research with a wide range of potential users which resulted in showers which take into account the needs of older people. The London taxi has a range of features which make them both accessible and easy to use. The extra cost of R&D can be relatively small and can be eclipsed by the wider market opened up by inclusive design.

### What can consumer organisations offer?

We consider that a fairly seismic cultural shift is needed in some parts of the manufacturing industry before inclusive design becomes commonplace. Work in the academic community, the growth of campaigning groups and the increasing frequency of international conferences already demonstrates that the pressure for change has some force. The main currency of consumers organisations is independent, reliable and research based information. Given that inclusive design depends on the closest possible understanding of consumer need, consumer organisations already have, and are continuing to collect, information which should be valued by designers.



The most obvious would be the supply of the results of product assessments. To some extent this already happens as a matter of routine. Before any Ricability report is published, each manufacturer is sent a summary of research findings for their own products as part of a standard verification procedure. On publication they can see these findings (and the conclusions we have drawn) laid out against those of their competitors. If asked, we can provide them with full methodological and technical research details.

This, and the background information we may have, should be of considerable help in the design of the next generation of products. Yet in the last ten years only two manufacturers of mainstream products have approached us for information. One had done so because we had produced a critical report of one of their products and a subsequent discussion at their factory revealed that they knew little about disabled or older people (prototypes were tried out by staff, most of whom were young).

### Technical advice

Consulting the user seems to be the most basic common sense to anyone who has worked for a consumer organisation. Consumer organisations have unique experience in the need to design and administrate technically robust user testing procedures while keeping the research within practical parameters. They have information on recruiting users, statistical design, techniques of eliciting information, on analysis and interpretation. It is likely that they have solved some of the perceived problems which inhibit designers from carrying out their own research.

### Influencing the market place

It is argued that product design will change only when manufacturers see that inclusive design makes good business sense. Part of the problem has been a lack of any vociferous demand from the market place. In the past, older people have prided themselves on their independence and have demanded relatively little. Expectations, based on a lifetime of experience, have been low – ‘what can you expect at my age’ is a typical reaction when they are asked to describe why a product is hard to use. Newer generations of older people, having spent

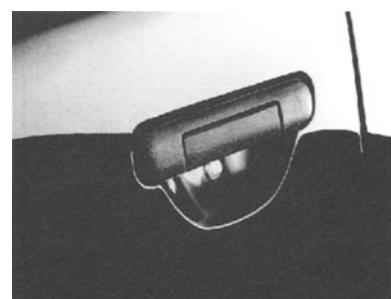
their formative years in a more consumer oriented society, are likely to be much more assertive.

Consumer organisations can help raise expectations and encourage people to be more demanding. Comparative information has the benefit of raising awareness by informing people about the range of inclusive features already available within a product range, and showing the comparative advantage of each. While some usability features are self evident and can be identified simply by comparing products in shops, others only become obvious when a product has been in use beyond the point at which it can be returned. The better this information, and the better it is disseminated, the more likely it is to influence the market place.

## Representation

Most consumer organisations campaign for improvements where research suggests this is needed. Campaigning for product specific legislation on functional design would be problematic for a number of reasons, including the fact that any such requirements would need to be European in scope. The Disability Discrimination Act (and its counterparts elsewhere in the world) has no requirement for products to be designed so that they can be used by disabled people, apart from utilities which are publicly provided such as telephone boxes and public transport vehicles. For example, the London taxi is a design partly bought about by local requirements that taxis should be more accessible.

However, European and International Standards organisations have produced guidelines for committees involved in the development of new Standards (ISO/IEC, 2001), and have provided guidance on the chief considerations that need to be taken into account. Although these guidelines are not mandatory they will put accessibility issues on the agenda of all standards committees. These are dominated by manufacturers but consumer representatives (including our own) will press for these recommendations to be heeded. Consumer organisations also represent their findings on government committees and boards of various types, including those of industry regulators.



London taxi – accessibility and clear, grippable door handle.

## Mainstream products and assistive technology

Inclusively designed products aim to be usable without adaptation by as many people as possible. Better designed products reduce the need for special equipment. For example, many word processing programs now have screen magnification options which obviate the use of clumsy magnification equipment. The increasing automation of cars is reducing the need for bolt on equipment. New developments in telephony such as the videophone or text messaging have possibilities which were once available on expensive dedicated equipment. Eight pages of a recent Ricability guide to telephone equipment (Ricability, 2002) was devoted to features of standard equipment which were particularly useful for disabled and older people. Despite this, some people will need some form of assistive device in order to be able to use mainstream products. We argue that, as part of the inclusive design philosophy, products should be made to accommodate these devices. Our experience of both groups of products could be of help to designers in achieving this objective.

## Regular links

In the past ,links with design colleges and those involved professionally with design have been ad-hoc and infrequent. More co-operation is needed on a more regular basis. Arrangements could be made to involve students at design colleges with our tests, with preliminary investigative work and other parts of the research process, such as the deliberations which lead to the compilation of buying guides. For our part we would like to include prototypes or early design concepts in our comparative tests. At the end of testing, laboratory engineers and user test administrators have a clear and detailed understanding of the advantages and shortcomings of the existing products, and, more often than not, have ideas for improving design further. This information needs to be shared in the interests of improving standards, and in a way that does not compromise our independence from manufacturing interests.

## Recommendations

A cultural change is needed in some parts of the manufacturing industry. Consumer organisations of disabled and older people, as well as research organisations, need to find ways of communicating, at a high level, with industry. They need to provide practical help to make

it easier for manufacturers to communicate with potential older and disabled customers throughout the design process.

Technology has made it possible for products to become more versatile. Products such as washing machines, VCRs and telephones have an increasing number of features and new hybrid products (such as mobile phones which incorporate a camera) combine hitherto completely distinct functions. The number of features can be a selling point, almost irrespective of whether these features are wanted or whether they are used in practice (for example, research into the use of washing machines has demonstrated that very few programmes are actually used by consumers). This (usually) means more complex controls, many-stepped operation sequences and, worse, impenetrable instructions. It is important that the pressure to accumulate functions does not exclude people who find them useful, or render the product too complicated to use.

Much work has been done on accessibility. Some of it is piecemeal and may not provide the actionable information designers need, or may be in a format which does not communicate its findings effectively. Thus while studies such as the 2001 DTI report (DTI, 2000) reveal something of the nature and extent of the problems facing older and disabled consumers, they do not go far towards suggesting a solution. Anthropometric measurements are an essential part of our understanding of human capabilities, but usually only describe dimensions or the limitations of typical movements. They may not reveal what is most comfortable, or be particularly revealing about dynamic movements or about people who lie outside the range of those measured. Detailed research which establishes detailed specifications for the optimum design for particular products is invaluable, but it can be difficult to extend and apply its conclusions to other product groups. There is the additional difficulty that recommendations can change. What was thought acceptable yesterday may be considered too restrictive tomorrow.

### Various developments are needed:

- General principles of ergonomic design need to be collected and summarised. Ricability has done this at a basic level and our findings have also been fed into the European and International Standards described above. These beginnings need to be taken



Inclusivity is about more than age and disability – transport should be parent-friendly too.

further by the provision of optimum specifications (e.g. for dimensions, shape, torque of controls) in a form which are easy for designers and engineers and non-specialist to identify and look up. Gaps in this literature need to be identified and research commissioned to fill them. This needs to be a continuous process to keep pace with new thinking and new products.

- However, it is essential that inclusive design is not seen as something which can be reduced to looking up a table of specifications. Inclusivity demands a more creative approach and some lateral thought. Guidance is needed on how statistical and research information can be used in the context of creative product development. Schools of design need to include this in their curricula.
- The existence of these sources of information and guidance needs to be widely disseminated in formats suitable for the range of their potential users.
- Inclusive design demands a greater degree of creativity from designers, rather than inhibiting their freedom. For this we need better documentation and dissemination of successful case histories (to show what can be done, identify successful approaches and provide evidence of a commercial pay off) geared to persuading the people who write the brief for designers and control the budgets which would allow for these developments.
- A more creative relationship with consumers is needed. Consultation needs to be more than the opportunity to choose the better of two alternatives or to rubber stamp decisions which have already been made. Research should be directed at achieving a better understanding of problems and a better understanding of the capabilities, aspirations and preferences of the diverse groups who make up the population.

## Acknowledgements

Chapter title image, from a series of packaging design proposals by Edward Goodwin and Richard Hartshorn, RCA Industrial Design Engineering graduates and 2002 Helen Hamlyn Research Associates, partnered with Waitrose. Other images courtesy of: Reader Communications; Georgina Ravenscroft; Ricability; Nick Rawcliffe,

RCA Industrial Design Engineering graduate and 2002 Helen Hamlyn Research Associate partnered with Omron, and Marie Lenclos, RCA Communication Art and Design graduate and 2002 Helen Hamlyn Research Associate partnered with Transport for London and Reid Architecture.

## Further reading

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**ISO/IEC (International Organization for Standardization/ International Electrotechnical Commission) (2001)** Guide 71: Guidelines for standards developers to address the needs of older persons and persons with disabilities

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**Ricability (2002)** Stay in touch

## **Business drivers**

This section looks at the drivers of inclusive design in business – demographic, legal, organisational and technological.

Roger Coleman of the Royal College of Art presents a demographic overview of living longer and discusses the profound implications for saving, spending and marketing of rapidly ageing populations worldwide.

Catherine Casserly and Marcus Omerod set out the legal framework for inclusive design and argue for it to be viewed as a real design challenge and an assault on discrimination rather than as a barrier to creativity. Joanne Coy looks at the organisational imperatives, basing her observations on the experience of Royal Mail in making employee well-being and service quality cornerstones of its business renewal.

The two final essays in this section address technology as a driver of change. Alan Newell looks at the potential of technology transfer to transform today's special adaptive interfaces and appliances into tomorrow's truly inclusive solutions. Alastair Macdonald explores a world of new materials, advanced computing and smart robotics capable of addressing diverse needs with an unprecedented level of innovation.

# Chapter 7

## Living longer

**Roger Coleman**  
Royal College of Art



## The challenge of age

Since 1900, UK life expectancy has increased on average by some 2.5 years per decade, one of the great achievements of the 20th Century (Kirkwood, 1999). As people age, they become more diverse as individual life-courses give rise to divergent experiences, interests, activities and capabilities. In the context of ageing populations, such diversity will increase, in particular as people explore the new possibilities opened up by 25 or more years of life-expectancy (Laslett, 1989).

With age, people change physically, mentally and psychologically. For most people these changes involve multiple, minor impairments in eyesight, hearing, dexterity, mobility and memory (Haigh, 1993). At present, such changes have a significant impact on older people's independence due to an unnecessary mismatch between the designed world and their older capabilities (Laslett, 1998). Unprecedented growth in the older age groups will challenge common assumptions both about the nature and spread of disability, and about the level of capabilities that products and services should be designed for if they are to meet the needs of the majority of the population. For example, a wheelchair-friendly world is not necessarily an age-friendly world – although the majority of wheelchair users are old, the great majority of older people are not disabled, and those that are have very different mobility requirements from younger wheelchair users.

By 2020 close to half the adult population of the UK will be over 50 years old, while 20% of the inhabitants of the United States and 25% of those of Japan will be over 65 (Coleman, 1993), yet the youth market continues to be looked to as the economic motor for the future. In the UK every additional consumer added to the marketplace over the past century has been an older person, and an opportunity has been missed to develop products and services for the only consumer sector with real growth potential. In the future, mainstream consumer markets will have to concern themselves with the substantial rise in the number of people who are less than able-bodied yet wish to enjoy an active and independent lifestyle. In this context it is increasingly accepted that as many people as possible should have physical and cognitive and intellectual access to the world around them.

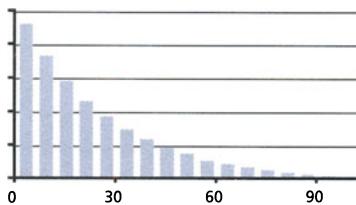
The problem is that much of the design community has yet to understand what this means, or how to achieve it. The challenge is to

By 2020 close to half the adult population of the UK will be over 50 years old

create a supportive environment of buildings, products and services and interfaces (Brouwer-Janse et al., 1997) that make it possible for everyone to live independent and fulfilling lives, for as long as possible. The more effectively this can be achieved, the less strain will be placed on social and welfare systems, and the more older people will be encouraged to spend the now considerable wealth they control on the goods and services that deliver independence and quality of life. A further challenge is therefore to develop a consumer offer that closely matches the aspirations of older people.

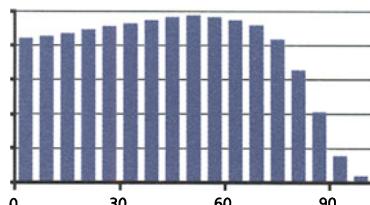
### The world grows older

Contrary to 100 years ago, when life expectancy was less than 50, Europeans can now look forward to 30 years of active life after 50 and expect to enjoy them as part of a substantial cohort of similarly mature friends and associates. The ratio of older people to younger people has been growing for more than a century, during which time the population of Europe as a whole has ceased to be youthful and must now be described as mature. There are of course exceptions, chief amongst which are the ex-member states of the USSR, and most notably Russia, where life expectancy has fallen in recent years. However, overall the trend towards aged populations is strong and well established, and in many instances almost complete. This is its great legacy, and our gain, but it brings enormous challenges too, and how we respond will determine the quality of our now-longer lives and the cohesion and economic well-being of society.



**7.1 Youthful population**

Above replacement fertility and low life-expectancy (schematic: numbers by age).



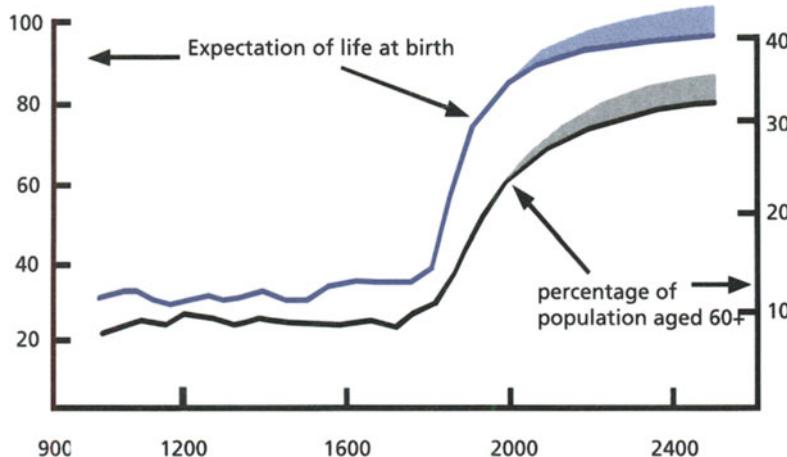
**7.2 Mature population**

Below replacement fertility and high life-expectancy (schematic: numbers by age).

The UK was the first country to undergo what Peter Laslett called 'the secular shift in ageing'. Over the course of this 'shift', the age balance of the population has changed out of all recognition, from the condition that typified all previous human populations (with some notable cataclysmic exceptions, like the time of the Black Death) where each succeeding generation was as large or larger than its predecessor and the population as a whole could be described as 'youthful' (Figure 7.1). This factor, combined with high levels of mortality, in particular in infancy, produced a characteristic age curve, with the great majority of the population aged 30 or less and only a tiny proportion aged 60 or over.

However, over the past 150+ years the age-balance has shifted substantially in favour of the older age groups, leading to a 'maturing'

of First World populations initially, – a trend which is spreading rapidly, resulting in an effective reversal of the age curve in the case of the more



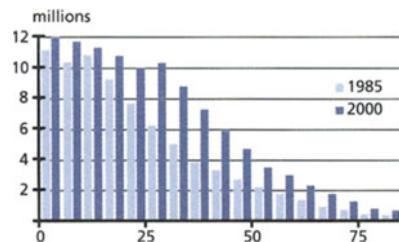
### 7.3 The 'secular shift in ageing'

Life expectancy and proportion of the population aged 60+ (after Laslett, 1989).

'mature' populations (Figure 7.2).

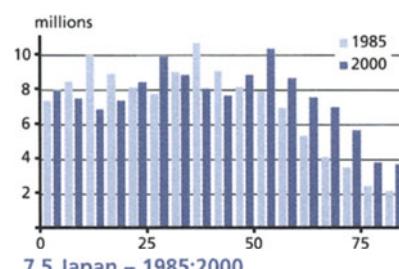
In the UK, from the early 19th century, life expectancy increased persistently, while the proportion of the population aged 60 and over rose from under 10% to more than 35% (Figure 7.3). The 20th century saw life-expectancy in the UK rise by 30 years, and across the EC it is reasonable to assume that by 2020, close to 50% of the adult population will be aged 50 and over, regardless of new additions to the community.

This age shift can be recognised in its infancy in developing countries like Mexico and India (Figure 7.4), where the effect of a reduction in birth rates and infant mortality is already evident. In other populations the rate of change is much accelerated by changing attitudes and behaviour among women, in particular in southern Europe and eastern Asia. Some populations, such as that of the Philippines, have only very recently begun to demonstrate this age shift; others, like China, are experiencing it in an accelerated form due to strict policies limiting reproduction, while Japan, due to dietary and other factors which favour longevity, is now the 'oldest' of all populations (Figure 7.5) and shows this development in its extreme form.



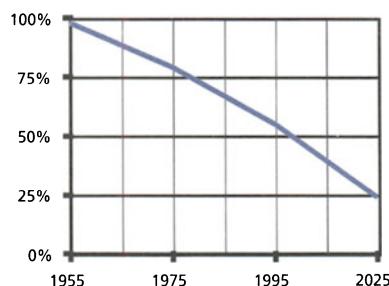
### 7.4 Mexico – 1985:2000

The age shift in its infancy, millions by age (data from Yoxen, 1991).



### 7.5 Japan – 1985:2000

The age shift at its most current extreme, millions by age (data from Yoxen, 1991).

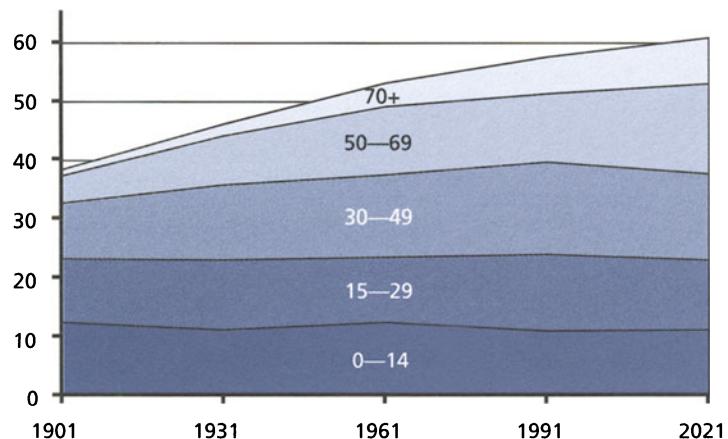
**7.6 Global fertility rates**

Percentage of world population reproducing at above replacement rate (WHO, 1998).

## Social change

Three social change drivers are behind this trend. Significant reductions in infant mortality due to advances in sanitation and medicine, long-term falls in birth rates due to changing social expectations and the increased status of women, and increasing longevity due to working conditions, lifestyle and medical factors, have restructured populations in a dramatic way across the developed world (Figure 7.6). In the UK, where these changes have been relatively gentle, over the past 100 years all the long-term growth has been among the over 50s, enlarging the older market sectors, while in recent years the number of younger consumers has been reducing, and will continue to do so unless birth rates rise again or immigration is actively encouraged (Figure 7.7).

If the world population stabilises during the next hundred years, as appears likely, the result will be a world population that is significantly older than it has ever been before, and ultimately one that is shrinking rather than growing. This change can, therefore, be described as radical and permanent. In Laslett's words it is 'virtually certain that this demographic situation is here to stay and will finally spread over the world.' The proportion of older and very old people will continue to increase for several decades, until the fundamental structure of a mature population is fully manifest, with each succeeding generation smaller than its predecessor. Once the residual growth due to falling mortality rates has worked its way through, these and other similar populations will begin to contract, a novel condition which will bring with it

**7.7 Growth of 50+ population in UK**

UK population by age (millions) 1901-2021 (Coleman, 1993).

some interesting and unexpected realities which may well challenge expectations of continuous economic growth.

This is good news for the planet, as a reducing population suggests that a balance can be achieved between the impact of human activities on the environment, other species and the ecosystems that sustain them, and available resources and natural regenerative processes.

Achieving that balance in an equitable and sustainable way is one of the great challenges facing the human race. A key feature of this challenge will be to come to terms with the reality of ageing populations, both at an individual level, where considerable mental readjustments will be required if we are to embrace the radical changes to the life course that this implies, and at a societal level, where we will have to ensure that old age is not a burden but a blessing. Doing this successfully will require extensive rethinking of personal goals and aspirations and significant changes in the way we design environments, products and services, to accommodate a new majority of older users.

**In effect an extra stage has been added to the life course, which Laslett terms 'The Third Age', offering opportunities for self-fulfilment not previously available to more than a tiny minority**

## Changing expectations

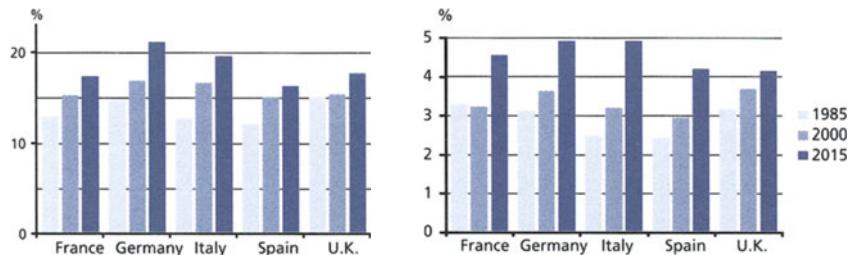
In the UK, at the end of the 19th Century, it would have been unreasonable to anticipate anything other than a short retirement after a life-time of work beginning at 14 or younger. The age of 40 was midway in this work-dominated life and seen as the onset of middle-age. One hundred years later, expectations are very different. People in 'mature' populations can reasonably anticipate a long period of life after work. In effect an extra stage has been added to the life course, which Laslett terms 'The Third Age', offering opportunities for self-fulfilment not previously available to more than a tiny minority.

In the UK, as Peter Laslett's map of the 'secular shift' in ageing clearly shows, the Industrial Revolution and population ageing are closely linked. However, a significant mismatch has arisen between their outcomes: a mismatch which impacts on each of us as we grow older and on society as a whole. Much of our social fabric and infrastructure – public buildings, private housing, transport systems, domestic and consumer products, and more – is no longer appropriate nor suited to the population we have become. Another significant mismatch has developed in the area of financial support for the elderly population. When the Welfare State was established in the 1940s, post-retirement life-expectancy was short, healthcare was nursing-based, and for every

dependent there were several people in work to pay for them. The pensions, benefits and healthcare systems put in place then were based on government revenue, not investment, and this model no longer fits our longer and very different lives.

For the UK, Laslett's conditions for the recognition and acceptance of such a Third Age were not met until 1950, making it a very recent phenomenon, but one which is already leading to a reinterpretation of the life course with consequent changes in lifestyle and activity. In the past, the main focus of design, both of products and environments, has been the working population. There is clearly an urgent need to direct attention to older sectors of the population, including: fit and active people in retirement (figure 7.8); affluent groups in old age; single households; women, who form a majority of the over 50s; and other groups which have been previously neglected both as consumers,

**7.8 and 9 Growth of 65+ and 80+ Age groups in Europe – 1985:2015**  
Percentage of total population  
(Coleman, 1993).



and from the point of view of design. There is also an urgent need to understand, and design for, the growing numbers of those in their 80s and 90s, who, while increasingly frail, desire to remain independent in their own homes for as long as possible (Figure 7.9).

Other aged and ageing populations are facing similar mismatches, while the consequences for the developing world are likely be even more problematic (Yoxen, 1991). At the social and political level the challenge is to ensure that older people remain active, integrated and contributing members of society for as long as possible. If that can be achieved in ways that older people welcome, then we stand to reap the benefits of longevity while minimising the costs. At a personal level, the aim is to maintain autonomy through an active, independent lifestyle supported by an adequate income, personal interests and a social network of friends and family. Achieving this will require changes in attitudes towards older people that ensure they are included in planning, decision making and product development. It will require

communication systems that keep older people connected with a rapidly changing world. It will require a real commitment to life-long learning, new thinking about the nature of work and volunteering, and pensions and financial services that better match present and future realities.

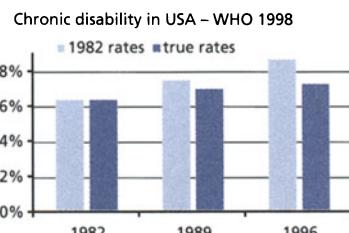
## Changing lifestyles

The opportunities are considerable. Already evidence is emerging to suggest that rates of chronic, age-related disability are reducing. According to WHO figures (WHO, 1998), whereas at 1982 rates, and due to the growth in the older population, the USA should have seen a 36% rise in age-related disability by 1996, from 6.4% to 8.7% of the population, the actual rate of increase was only one third of that expected. This represents a very significant improvement (Figure 7.10). Although there is little doubt that medical advances have contributed to this improvement, lifestyle factors like diet, exercise, smoking and general activity levels, also play an important role in the development of cardio-vascular disease and other chronic conditions.

In the past, such conditions were considered an inevitable counterpart of old age, but this recent evidence from the USA, along with similar UK data, suggests that chronic, disabling disease is not inevitable. Indeed, if the reduction achieved in 14 years in the USA could be improved on by a very small factor, we could confidently foresee a time when increases in the older population will not be accompanied with increases in disabling conditions and the associated social and economic costs.

From a societal perspective there is much to be gained by encouraging and supporting health enhancing lifestyle change. In the UK, a recent report, *Fit and Fifty?* (Scales and Scase, 2000) drew attention to the age-independent lifestyles and leisure patterns of those in their 50s, which are 'surprisingly similar to those in their 30s and 40s'. It is increasingly recognised that we can be fit and active well into old age, and that what it means to be a particular age is no longer something dictated by tradition or custom.

It is true that impairments are more likely to come with age and, contrary to common assumptions, most people who can be described as disabled are old, not young, and far outnumber younger disabled people. Age-related disability is typically slow to develop, but multiple

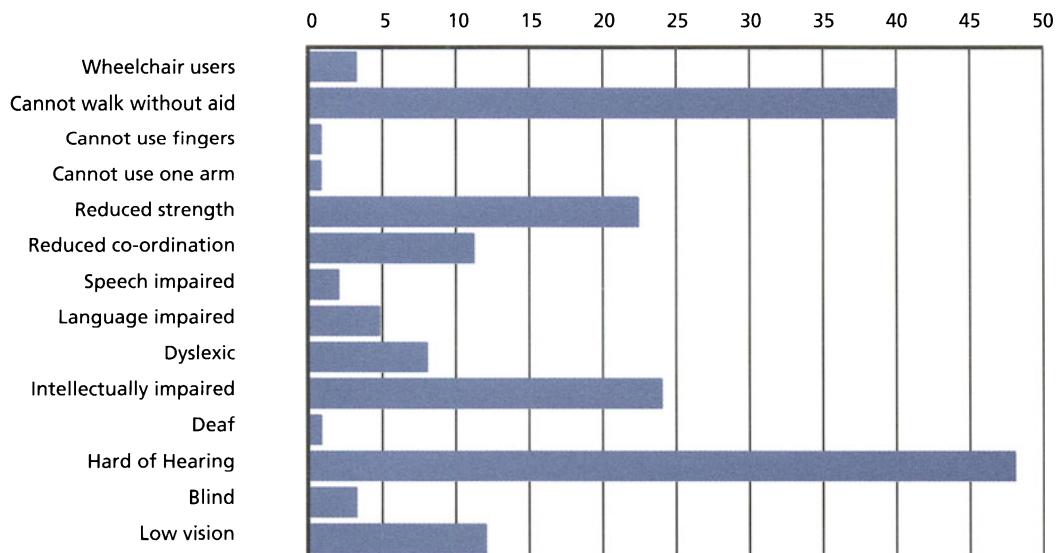


**7.10 Chronic age-related disability**

Percentage of US population 1982:1996 (WHO, 1998).

in nature. Most older people will display multiple, minor disabilities, with some reduction in hearing, vision and mobility, but good design can significantly reduce the impact of such impairments. We only become aware of our limited eyesight when small print forces us to rummage for our reading glasses. It is not our impairments that are the problem, but the poor design of products which turns them into a source of disability.

John Gill, at the RNIB, has estimated the numbers of disabled people in geographic Europe – west of the Ural mountains – with a total population of around 800 millions (Gill, 1997). In graph form, his calculations reveal some interesting factors (Figure 7.11). First, the large majority of disabled people suffer from age-related impairments, and second, the ratio of such, often multiple, minor impairments, to the more major impairments, is likely to become even more pronounced with population ageing. As a consequence we will have to make radical



#### 7.11 Disability in geographic Europe

Millions affected out of a total of 800M  
(Gill, 1997).

reassessments of what we regard as typical, and of the composition of the disabled community. A further point to note is the effect of double counting in trying to establish accurate figures, given that the most prevalent disabilities are related to poor hearing and mobility, which are often combined in later life. Points taken up in chapters 2, The struggle for independence, and 21, The prevalence of functional impairment.

Design has a significant contribution to make here, by providing the goods and services that facilitate and encourage the active enjoyment of older age. For what scope we have to enjoy our extra years will depend crucially on how products, services and environments are designed. The challenge is to do with enabling people to cope with, respond to and take up the opportunities of a changed society. It is the numbers that make the business case compelling, but beyond the numbers are other less obvious factors that make the business case equally compelling.

For example, with the numbers of younger people set to decline on a global basis, those companies that restrict their consumer offer to the young will be obliged to trade into a contracting marketplace, where competition will become ever more intense and they will have to run ever faster simply to stand still. By comparison, the older marketplace is set to expand for many years to come, and those companies that begin to understand it and establish a firm grip on it as a consequence will find themselves trading into an expanding marketplace with strong export potential. If successful they will achieve the levels of sustained profitability that can support design and innovation.

The business challenge is therefore to develop a rounded consumer offer that appeals to older people by supporting their aspirations and changing lifestyles. By giving older people a rationale for spending rather than saving their money, in ways that are life enhancing and offer new opportunities for comfort, enjoyment and self-fulfilment, business can stimulate the economy in ways that will benefit people of all ages. Conversely, if the people who commission design exclude older people from their target market then the choices older people have will be limited, and they will be effectively excluded from our modern consumer societies.

It seems increasingly safe to assume that our extra years will be active ones, and that significant illness and disability will continue to be concentrated in the last 5 years of life, with the major costs coming in the final 6 months. If people can be encouraged to make the changes that will ensure they are healthier and fitter in later life, then increases in disability and dependency need not necessarily follow from the ageing of the population. Collectively, older people command a substantial disposable income and control a significant proportion of the country's wealth and savings. If sufficient of that wealth goes back into circulation it will generate business and employment opportunities

**Companies that restrict their consumer offer to the young will be obliged to trade into a contracting marketplace**

that will help to keep the economy healthy. Although the demand for healthcare at all ages is growing along with raised expectations and evolving technologies – and there are big issues surrounding how all this is paid for – there can be little doubt that reductions in disability and dependency will lead to savings in care costs.

Medical interventions, like replacement joints and cataract removal, may be expensive, but they add active years to life, and so have an impact on disability and dependency. Design interventions can also make a significant difference, by extending disability-free life, reducing dependency by making public environments and services more accessible, making homes safer and more age-friendly, and increasing the usability of products for people of all ages and abilities. Design can improve the way new technologies are implemented, encourage the lifestyle changes that will improve people's general health and vitality, and facilitate local networks of support and friendship.

Design interventions need not be expensive. In housing, for example, incorporating the features that make a dwelling age and ability friendly – wider doors, flat thresholds, walk-in showers, ground floor toilets, power points at hand height, well-lit stairs, etc – adds little to new-build costs. Fitted later, after an accident say, they can be very costly. Features that make bathrooms and kitchens safer and easier to use, like lever taps, pull-out drawers for heavy items, suitable choice of floor coverings and colour contrast, can all be incorporated as part of the process of home improvement, again with little or no added cost, and enhance the appeal and convenience of our homes. The key here is early consultation and advice, in formats that encourage people to take advantage of what is already available, and product improvements that offer benefits to all people in terms of safety and usability.

## Working lives

Maintaining an income over a period of perhaps 30 years after full-time work is a new challenge and an important one that will change the shape of later life. The concept of retirement is about to undergo fundamental changes with the abolition of a set age, while the trend towards early retirement is likely to be reversed in an era of low returns on capital. Pensions will become one element in a portfolio of income sources for those lucky or prudent enough to have accumulated wealth, while continuing employment, either full or part-time, will

become an essential supplement to pension income for the majority. The implications are that companies will need to offer more part-time and job-share opportunities, individuals will need to learn to accept positions with reduced responsibility, and government will have to actively promote learning opportunities for older people. Paid work or unpaid volunteering will provide opportunities for social contact, regardless of financial need, and a wise government will look at ways to encourage formal and informal networks which help to keep older people integrated within communities.

If we are to encourage longer working and learning lives and increased volunteering, then working and educational environments must support that aspiration, and this requires a major rethink of workplace design. Until recently, the focus was essentially on young able-bodied people, the people in work. Now, with disability discrimination legislation in place and age discrimination legislation likely to follow, ergonomics and the design of environments, tools, equipment and everything else associated with work will have to change to include the needs and capabilities of people previously excluded from the workforce.

Legislation will place increasing obligations on employers, building managers, retailers and service providers not to discriminate against people on the basis of age or capability. Important here will be the growth of older workers, and the changing patterns of work associated with this shift. Companies will have a requirement to make the workplace age-friendly and accessible, and the impact on business will be felt as much there as in the marketplace. Failing to meet legal requirements will be expensive; failing to be seen to support the spirit behind legislation will damage reputation. Conversely, if making things work for older people becomes part of a broader, inclusive objective, where every worker and every customer is special and welcome, the rewards will be considerable. This is a goal the whole company can get behind, and one that can be rolled out in terms of improved products, services and customer relations, although litigation may be the driver in the short term, before companies see the other benefits.

**If making things work for older people becomes part of a broader, inclusive objective, where every worker and every customer is special and welcome, the rewards will be considerable**

## Design exclusion

If people are excluded from the mainstream because of age, capability, location or income, then their lives become problematised, they

**A journey can be seen as a chain of individual products and services whose accessibility is only as strong as its weakest link**



Barcelona Metro station with tactile paving.

become a burden, a drain on resources, and a source of social division and conflict. Not because of who or what they are, but by virtue of being excluded. At this level the European political project of social inclusion becomes a design issue, because the very fabric of our historic and culture-rich Europe – its cities, monuments, dwellings and public spaces, museums, galleries, and transport systems – was not conceived or constructed to accommodate large numbers of older people. The potential consequence is design exclusion, and in order to deliver social inclusion we need to recognise that many people are effectively excluded by design when they could be included by it. The emphasis here is shifted away from age and capability and on to design and its social consequences.

From this perspective it becomes possible to flesh out the concept of inclusive design as a process whereby designers address the needs of the widest possible audience by including the needs of groups who are currently excluded from or marginalised by mainstream design practices, and in particular, older people. This means ensuring that the environment is supportive of older people in all their activities – products for daily living in the home, local transport to shops, offices and other workplaces, leisure and learning environments, fitness centres, long-term care environments, retail environments and long-distance travel.

For example, a journey can be seen as a chain of individual products and services whose accessibility is only as strong as its weakest link. Where do we find information about the chosen destination? Is it readily accessible to older people? How do we book the ticket, by phone, in a travel agents, on the Internet? How easy is it for older people to do this? How are they treated by staff, by software, how easy is the screen to read, or the brochure? How do we get to the airport? Is there local transport to the station? Is the train easy to get on and off? Do bags have to be carted over gaps and rough ground? How far do we have to walk at the airport? Is the signage easy to read, are the announcements audible, is the environment confusing or intuitive to navigate? How long are the queues? Is there somewhere to sit down?

We can ask similar questions about getting on the plane, about the plane itself, and about what happens at the other end. The detail of a relatively simple journey is enormous, and at each step of the way there is the possibility of excluding not just older people, but parents

with pushchairs and people with temporary or permanent disabilities – anyone who does not conform to a narrow definition of ‘normality’. Take the Eurostar from Waterloo and you start by having to lug bags across a gap between platform and carriage. Arrive in Brussels and a pair of steps has to be folded out to reach the platform. To anyone with heavy bags, a pram, a wheelchair, the journey is made difficult and stressful. The unfortunate result is design exclusion for large numbers of people. Billions of pounds were spent on this project and we got it wrong.

Why? Because some design decisions, like the relative height of platforms, were taken out of the hands of the designers. Other factors never got into the design briefs, and the designers didn’t push for inclusivity. How did this happen? No one was required to think through the user experience from the point of view of the whole range of people who might be using the service over its decades of life. In the social and mental health services, staff are now accustomed to producing a ‘risk assessment’ for every client and intervention as a requirement. A similar ‘user assessment’ for new environments products and services would go a long way to avoid such mistakes in future, while significant new opportunities will emerge for service providers through linking the disparate elements of everyday activities in a convenient and pleasurable way. A focus on exclusion during design may be just what is required to change the behaviour of service and product providers.

### The life in our years

Understanding design exclusion is an imperative first step towards ensuring that goods and services are ‘age-friendly’, but that is only half the story. The other half comes from a deeper understanding of the lifestyle and aspirations of older people, of how their lives are changing, and how they are likely to change, and importantly, how might they change – what possibilities are there that older people have yet to dream of. A key factor here is life expectancy. In a sense, people of all ages have yet to understand the reality of the modern life course, and plan for the sort of life expectancy that is now the norm. Peter Laslett pointed out that as little as 50 years ago we reached a critical point in the UK, where the likelihood of an extended period of retirement in the company of a surviving cohort of friends sufficient to make it worth investing in, became a reality (Laslett, 1989). Many of us



Barrier-free streets in Barcelona.



### 7.12 Life expectancy in the UK

(Continuous Mortality Investigation Bureau, Institute of Actuaries, 2000).

have yet to come to terms with this fact, while over the intervening half century life expectancy has risen by a further 12-13 years, making that sort of planning even more of an imperative.

Life expectancy figures can be confusing. They do not tell us in finite terms how long we have to live, but indicate the probability of survival. For example: at age 60, remaining life expectancy for men is 21.2 years and for women 25.9 years, which means that half of all 60 year old men will still be alive in 21.2 years time, with 60 year old women doing a little better (Figure 7.12). And of all of those men that live to age 80, half will live on to 87.8, and so on, hence the growing number of 80, 90 and 100 year olds. In other words, modern lives can be very long, and beyond the immediate challenges of maintaining an income and a degree of health and vitality, lies an uncharted territory of extended later life that simply was not there 50 years ago.

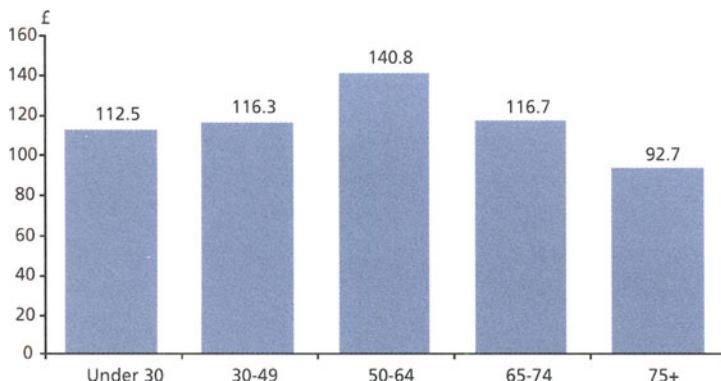
Here is where the real personal and economic opportunities lie. The trick is to identify them, and this is where business is failing to rise to the challenge. While commercial companies, and importantly the marketing and advertising executives who serve them, persist in regarding older people as unfortunates or objects of fun and pity, they are unlikely to profit from delivering the sort of consumer offer that can support older people in exploring this new territory. In fact, there are many ways to begin to identify such opportunities. One is through working with older people – a process that is well documented and described at length elsewhere in this book (Coleman, 1997). Another is to try and understand the patterns that are revealed by studying how older people are behaving.

## Changing lifestyles – new products and services

The Henley Centre for Forecasting, a leading UK market and trends research company, documents UK patterns of spending and leisure activities on a regular basis, and so has a wealth of data on the subject (Henley Centre, 1993 and 1995/6). As part of a 1997 collaboration with the DesignAge programme at the Royal College of Art, some of that information was revisited from an original perspective. The convention in market analysis is to segment primarily by age, with socio-economic status adding finer detail; and to focus that segmentation primarily on the 20-50 age groups, with the 50 or 55 pluses lumped together in one 'box', as if they are consistent in

attitude, taste, behaviour, lifestyle and economic status, and of little interest as a market sector.

Instead of following convention, this analytic approach was turned on its head (Henley Centre and DesignAge, 1997). All the under 50s were treated as a single group, while the over 50s were segmented into 5-year bands, from 50-54 to 75+. Even this segmentation is limited, as it would be interesting to extend it beyond 75. However, some most interesting patterns emerge, which point to significant design and market opportunities. For example, on the whole older people spend little more time on household chores than the under 50s, although up to age 75 that time does gently increase, suggesting that the same jobs take older people longer. Nor do they spend appreciably less time on personal appearance. All of which suggests an extending market place for personal toilet and household cleansing goods, in particular if they can be made easier to use.



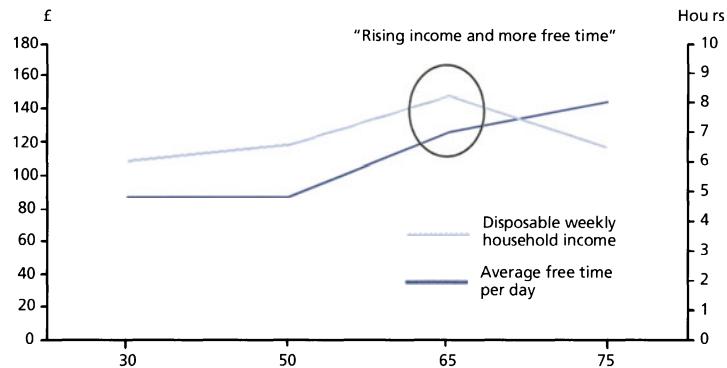
**Although a considerable proportion of older people are in the low income groups, many have high disposable incomes**

**7.13 Individual weekly expenditure**  
(Henley Centre Family Expenditure Survey, 1995/96).

Older people spend a little more time on grocery shopping than younger people, and are probably more value conscious because they have more time to make the comparisons. Indeed, time is key here. Older people have significantly more free time than younger people who are more likely to be in fulltime employment, with young families to care for. Although a considerable proportion of older people are in the low income groups, many have high disposable incomes, and as a whole the over 50s spend as much if not more than the younger age groups (Figure 7.13).

This gives rise to what the Henley Centre describes as the end of the 'time/money paradox'. Whereas in the past, in the UK, when people were, paradoxically, at their maximum earning power, they were likely

**7.14 Disposable weekly household income, average free time by age**  
 (Henley Centre, Leisure Tracking Survey and Family Expenditure Survey, 1995/96).

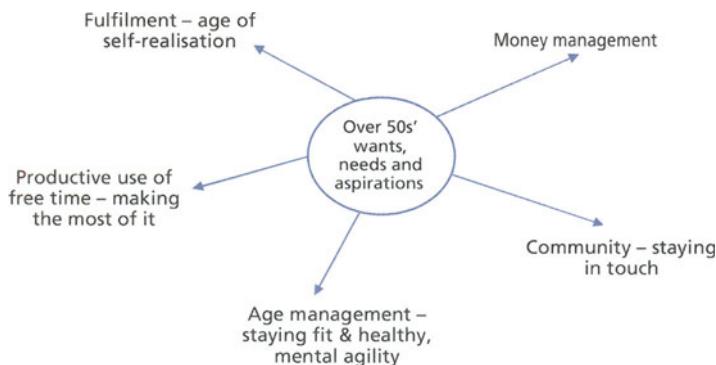


to have less free time to make use of it, while when free time increased, typically in retirement, their incomes would be falling. More recently, reductions in the working life, coupled with increasing wealth among the older generations, has lead to a reversal of this situation (7.14).

It is difficult to predict how persistent this condition will be, as the return on pensions and other investments is an important contributing factor, and these have been persistently lower in recent years. Nonetheless, older people control a substantial proportion of capital and investments, much of which passes on to their children in the form of inheritance. Were there a better consumer offer targeted at older people, in the form of goods and services that could enhance their quality of life and offer increased opportunities for enjoying the considerable free time at their disposal, then older people might be encouraged to spend more in their lifetime and leave less to their heirs. Such a shift in spending patterns could have two useful outcomes. First it could act as a boost to the economy, and so to jobs and employment for younger people; second, it could help to reduce the costs of dependency. Both these outcomes could be beneficial to younger people and to society as a whole, while responding to the changing wants, needs and aspirations of older people.

A deeper understanding of these changing realities opens up considerable opportunities for companies to identify with and support older people in successfully negotiating the new landscape of older age that Peter Laslett began to describe in his seminal work, *A Fresh Map of Life: the emergence of the Third Age*, where he discussed the demographic and social drivers behind an inevitable reassessment of later life and what it holds for us, and the increasing flexibility of the idea of age itself.

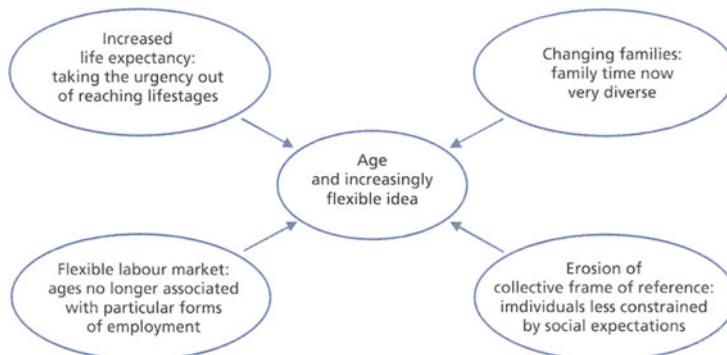
In its 1996/7 publications 'Planning for social change' the Henley Centre identify some potential trends with powerful implications for both commerce and government. Mapping the wants needs aspirations of what it terms the 'New Old' – less conventional people in their 50s and early 60s, who are perhaps give an insight into how the 'baby boomers' will respond to becoming older – and exploring the factors driving the increasingly flexible interpretation of ageing that is already evident, gives a backdrop against which shifts in preferences and leisure activities point to commercial opportunities (Figures 7.15-16)



#### 7.15 Over 50s' wants needs and aspirations

(Henley Centre, Planning for Social Change, 1996/97).

By revisiting data from its leisure tracking survey and exploring changes in preference with age, it emerged, for instance that eating out at restaurants is a favourite from age 50 to 75 and beyond, whereas they become less attracted to pubs. From this it is clear that the brewing industry needs to think carefully about how it develops its assets in the future, in order to balance the attraction pubs have for younger people with older people's interest in eating out in a calmer environment, and to reflect the changing age profile of local communities.



#### 7.16 Age an increasingly flexible idea

(Henley Centre, Planning for Social Change, 1996/97).

**There is an opportunity here to offer people designs and products that can effectively 'futureproof' their homes**

Walking is a very popular leisure activity amongst older people, who recognise the health benefits that come with it. However, the multiple minor impairments that come with age can reduce the pleasure of walking, and as that happens, so older people turn to their cars for both leisure outings and for shopping trips and other essential components of an independent life. In other words, an ageing population will become increasingly reliant on the motor car as an aid to independence, at precisely the same time as governments are trying to reduce car use for environmental reasons. What this means is that unless older people are offered real alternatives to car ownership, either environmental objectives will not be met or, dependency levels will rise significantly. Both outcomes will be costly to the state, which would be well advised to invest vigorously in improved public transport, in particular in rural areas.

But this situation also promises commercial opportunities to those smart enough to spot them. Alternatives to the existing model of public transport – transporting large groups over fixed routes in large vehicles – that offer customisable journeys in vehicle types that are flexible enough to suit individual needs, could greatly reduce reliance on the private car while opening up new markets in personal mobility from the local to the international scale. Who will provide such services and how will they function? Will it be the AA, or Ford, Virgin, local authorities, or a new breed of mobility providers that fills this particular need? What will the vehicles look like that will deliver these services? Those are interesting questions, which the Helen Hamlyn Research Centre (HHRC) has been investigating in collaboration with the Transportation Design Department at the Royal College of Art.

Interest in Do-It-Yourself and home improvement persists well into later life. There is an opportunity here to offer people designs and products that can effectively 'futureproof' their homes by ensuring they are safe and age-friendly. The HHRC researched this issue, with support from the Lifespan Trust, and discovered that people were prepared to invest in their homes into their 60s and beyond if the emphasis was on design and home improvement, not adaptation (Pearce, 1999). The results –new designs for kitchens and bathrooms that met older peoples aspirations for style and comfort, while paying particular attention

to usability and safety – were shown on BBC2 to audiences in their millions.

The Henley Centre survey results also point to a significant opportunity to improve the safety and usability of hand tools and associated products in ways that allow people to carry on their DIY and handicraft interests for longer. The HHRC has worked with leading DIY retailer B&Q on making power tools easier to use for older people. Focus groups and extended trials with older consumers were used to identify features that can be improved – ranging from grip and balance to grouping and identification of controls, packaging and information – resulting in new light-weight power tools for B&Q which offer ease of use benefits to people of all ages. Similar work has been carried out with vacuum-cleaner and domestic product designer and manufacturer James Dyson, resulting in guidelines on usability issues to assist in-house designers in developing age-friendly but mainstream household products. These and other examples of age-friendly research and development are discussed later in this book.

## Summary

Population ageing is a new, radical and unprecedented development for which humanity is ill prepared. However, and despite many scare stories in the press, it is the result of considerable social, medical and technical advances, and represents a great gift of extended life to many people. The challenge is to come to terms with this new reality at a personal and societal level, and to create a world which is age-friendly and a society of which older people can remain independent and contributing members for as long as possible.

Design is a crucial instrument for successfully meeting this challenge. Through design, not only can we develop the age-friendly environments, products and services that are urgently needed, we can also open up new commercial opportunities based on improving the quality of life of older people and the range of choices available to them.

## Acknowledgements

This chapter draws extensively on the Design Council Policy Paper Living longer: the new context for design, by the same author.

Chapter title image: Women's Institute members enjoying a picnic lunch during their AGM at the Royal Albert Hall, London, Pascal Anson; Barcelona images, Karin Bendixen.

## Further reading

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## Chapter 8

# The legal argument for inclusive design

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The legal drivers for inclusive design based on the UK context are explored in this chapter. The principles are equally applicable in other countries if their legislative framework is applied instead. Differing design environments are considered, starting with the designer's own practice and moving through transport design, services and facilities related design, education design, products and goods related design, and concluding with the design of premises and the built environment. The overlap between the differing design environments is explored and the conclusion drawn that increasingly the legal drivers are seeking to remove barriers and discriminatory situations. The legal frameworks that are currently being put into place should assist designers to produce convincing arguments for their clients to adopt an inclusive approach in their commissions.

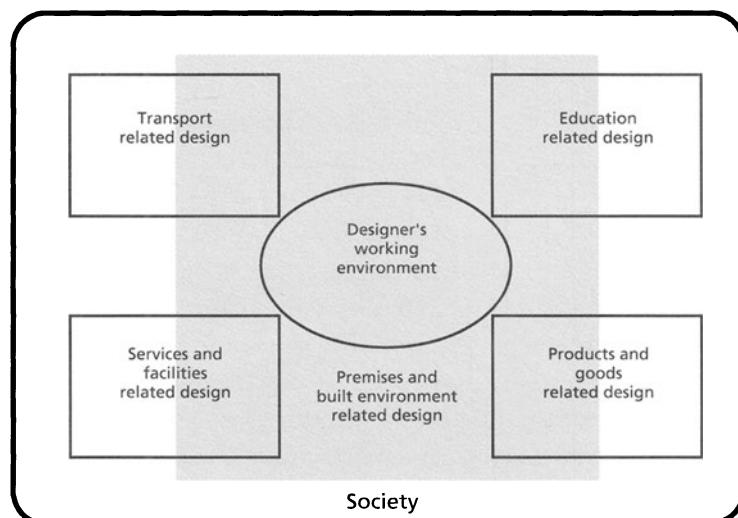
There are many arguments that may be given to encourage designers to adopt an inclusive design approach. Morally, designers as part of society should look to remove barriers and obstacles that create disabling environments. From a sustainability stance, there is a strong argument to create communities that encourage participation regardless of age, gender or circumstance. Professionally, the ethical codes of conduct of design-related institutes will promote equal opportunity and respect for people in their membership rules for designers. Economically, inclusive design argues that increasing the numbers of people able to use the design expands the market share and increases business profitability. The focus of this chapter is on the legal arguments for inclusive design and the other arguments are covered within other areas of this book.

The purpose of this chapter is to highlight inclusive design issues through legislative drivers rather than to provide a comprehensive review. The context for this is based on the UK, but the arguments are equally applicable in other countries using their own legislative framework. The main UK legislation giving impetus towards an inclusive design approach consists of the Disability Discrimination Act 1995 (DDA) and the Special Educational Needs and Disability Act 2001 (SEND). It is not the intention to cover these Acts in any detail in this chapter, but guidance on their interpretation can be found at the website referenced in the section on further reading at the end of this chapter.

There are two distinctly different environments that need to be considered. The first environment is that in which the designer finds themselves – their place of employment. The second is the environment in which people will use their completed design. A design that is not for use by people, such as the design of an internal component to be incorporated into some other object, is less likely to be the subject of the legal drivers discussed in this chapter. – although there may be a knock-on effect if the other object is then subject to use by people, and the design of the internal component is the cause of discrimination.

Figure 8.1 illustrates the environments that are covered in this chapter. The differences between the design-related environments are drawn from the legal drivers that impact on them and are not meant to imply an exclusive list of design disciplines. A different legal system might use other ways to draw distinctions. In Figure 1 the designer's working environment sits centrally surrounded by transport, services and facilities, education, product and goods related-design environments.

Underneath all of these environments are premises and built environment related design, since this is often an integral part of the other environments. A transport system may use a building to facilitate ticket purchase and therefore needs inclusivity in both environments, and is subject to differing legal drivers operating in these environments. Tickets may be offered also via the Internet and the issues then are only



8.1 Designer's working environment.

in the communications environment. Finally, in this figure the whole is embedded in the society for which the designs are being created. A different society with different culture, legal framework and language may have different environments.

**The DDA 1995 covers the complete sphere of employment relationships**

## Designer's working environment

It is useful to consider first the legal drivers that will affect the designer's own working environment – the design practice. It can be a salutary experience to stand back and review the inclusiveness of the environment in which you conduct your day-to-day designing. It is also important to put one's own house in order before trying to resolve external problems on inclusiveness for your clients. An inclusive design practice can draw on the way that they have solved their own problems in order to inform clients. Additionally an inclusive environment will attract a wider range of clients and easier interactions with people generally as the barriers are removed. The starting point should be the attitude towards employment and an inclusive approach is one that provides equality for disabled employees.

The DDA 1995 covers the complete sphere of employment relationships, from applying for a job to dismissal, promotion, transfer, training and receiving any other benefits. Its purpose is to prevent discrimination against a disabled person in much the same manner as the Race Relations Act (1976) and the Sex Discrimination Act (1975), but the specific definition of discrimination in the DDA is very different from these other Acts. Currently the DDA does not apply to employers with fewer than 15 employees, but contract workers are included as employees. There is lobbying for this number to be reduced and it is being challenged under the Human Rights Act since small employer exclusion is not applied in any of the other anti-discriminatory statutes at present. However, the government has stated in its consultation on the implementation of the European Employment Directive – *Equality and Diversity: The Way Ahead* – that the small employer exemption will be removed in 2004.

The definition of disability under the DDA has come under considerable scrutiny since the protection against discrimination only applies to those people who fall within the Act's definition of a disabled person. The definition is fairly narrow in comparison with inclusive design aspirations and social models of disability. The Disability



**The DDA requires employers to make reasonable adjustments to their work arrangements ... to ensure that disabled people are on a 'level playing field' with those who are non-disabled**

Rights Taskforce and the Disability Rights Commission have proposed changes to the definition, but further caveats and exemptions which these changes will inevitably involve, is likely to further complicate an already difficult definition. A broader inclusive definition that focussed more on the behaviour that may be potentially discriminatory, rather than a dispute over whether or not an individual is disabled within the meaning of the Act, such as that in Ireland or Australia, would be useful. Nevertheless, the definition still covers a wide range of people.

For a design practice there is a legal driver for inclusive employment through the DDA. The Act makes it unlawful to discriminate against a disabled job applicant in the arrangements made for determining to whom a job should be offered; in terms of which employment is offered; or by refusing to offer, or deliberately not offering, the disabled person employment. It also covers discrimination of disabled employees in opportunities for promotion, transfer, training, receiving any other benefits, subjecting a disabled person to any other detriment – such as harassment – and in dismissing a disabled person.

The DDA requires employers to make reasonable adjustments to their work arrangements and physical features of their premises to ensure that disabled people are on a 'level playing field' with those who are non-disabled, or who have a different disability. This should then ensure that the best person to do the job is selected regardless of age, gender or circumstance. Adjustments might need to be made to the physical features of the premises to remove barriers to employing the disabled person; to the manner in which the person undertakes the work; the equipment used in undertaking the work; or the day-to-day running of the practice, for example. The determination of what is a reasonable adjustment is crucial for both employer and potential employee. Larger practices are considered to have more resources to draw upon in making adjustments than small firms.

### **Arriving at practical solutions**

Discussion with the applicant, or employee, of the adjustments necessary to create an equal working environment is a useful way to determine practical solutions. Additionally the disabled person and the employer may be able to draw upon other resources, such as Access to Work, to fund specific equipment for their use in their employment. However, employers should be careful not to impose upon disabled

people a duty to give a long detailed explanation as to the effects of their disability, or try to seek funds, merely to allow the employer to make adjustments which they should have done in the first place anyway in order to benefit everyone in that work environment.

Additionally an inclusive design practice will tend to attract a wider range of clients, focus groups and visitors to the practice offices. Potential barriers to entry, use and interaction of the practice facilities will be considered and strategies put in place to remove them. The legal drivers are focused more on the rights of employees than visitors, but the steps taken to make adjustments for employees may benefit others using the premises. A design practice that only deals with corporate clients rather than members of the public is unlikely to be considered to be providing a service under the DDA, however if the practice decides to invite members of the public into the practice offices for say an open day then they become potentially liable under the DDA. This example illustrates how the boundaries between situations that are covered by the DDA and those that are not need to be carefully studied and how adopting an inclusive approach will be the best option in order to avoid claims of discrimination even where it is not immediately apparent. It is only a disabled person who can bring a claim under the DDA, either as an employee, potential employee, or as a member of the public using a service provided by the practice.

The area of education was originally excluded from the DDA but subsequently addressed by the Special Educational Needs and Disability Act (SENDA) 2001, which effectively brought education into the DDA. SENDA amended the DDA so that education was dealt with more extensively than it had been previously but with a differing timescale for implementation. The main implication for a design practice under SENDA is that of the engagement of year-out students on placements and would require an inclusive approach in order to avoid discrimination. Although there are obligations on the educational establishment to try to ensure the placement is accessible and non-discriminatory there is a similar onus on the employing practice, if paying for the student as an employee, to ensure that they put in place any adjustments necessary to allow equality of experience for a disabled student. After 2004 the European Employment Directive will also cover unsalaried placements.

**The interfaces between differing transport systems need to be developed to allow ease of use and flow between one system and another**

## Design environments

Referring back to Figure 1 the distinctions between the various design-related environments may seem artificial and capable of many categories. The environments have been chosen simply because in the UK context the legal drivers of the DDA and SENDA have identified these separately and provide differing rules for them. The premises and built environment is shown overlapping with the other environments due to the use of buildings to facilitate many other activities. Although the design of the building may not be directly affected by a legal driver, as a consequence of discrimination in the provision of the activity or difficulty in employment of a disabled person caused by constraints of the premises, it may be the underlying barrier. An inclusively designed building can assist in the design of the other design-related environments by avoiding the need for bolt-on solutions to the building.

## Transport-related design

Part V of the DDA deals with transport by allowing the Government to set accessibility standards to enable disabled passengers to get on and off, without unreasonable difficulty, and to be carried in safety and reasonable comfort on trains, public service vehicles (buses and coaches) and taxis. Transport systems not currently covered by the DDA include aircraft, maritime transport, vehicle breakdown recovery services, car rental and private hire minicabs (there has recently been a guide dog bill passed to require private taxis to carry assistance dogs, although there is no implementation date as yet).

The Rail Vehicle Accessibility Regulations 1998 covers new rolling stock for passenger carrying railways, tramways, monorails systems or magnetic levitation systems since the start of 1999. Buses and coaches are covered by the Public Services Vehicle Regulations and applies to new vehicles since August 2000. The timescales for implementing these changes is in the order of decades rather than years and relies on replacement of existing vehicles with accessible alternatives. The legal drivers cover individual modes of transport but for inclusive designers of transport systems the interfaces between differing transport systems need to be developed to allow ease of use and flow between one system and another.

## Services and facilities-related design

The DDA makes it unlawful for a provider of services and facilities to discriminate against a disabled person. The definition of a provider of a service is someone who provides a service to the public, or a section of the public, irrespective of whether there is a charge made for the service or if it is provided free of charge. Designers are not covered unless they are providing services directly to the public. As a potential example of this situation a designer is unlikely to be providing a service to the public when engaged by a corporate client. However, if that designer offers to take part in a national event that offers to members of the public free consultation sessions as part of a design week then they would be covered by the DDA.

Some examples given by the DDA include:

- Access to and use of means of communication.
- Access to and use of information service.
- The services of any profession or trade, or any local or other public authority.
- Facilities for entertainment, recreation or refreshment.
- Facilities provided by employment agencies.

The cornerstone of Part III of the Act is the duty to take reasonable steps to make adjustments to enable disabled people to make use of a service. Unlike the employment duty, the duty is a general duty owed to disabled people at large, and this means that it is anticipatory: service providers have to anticipate the needs of disabled people in advance and to make changes to their service so that it can be used by disabled people. It is also an evolving duty – what is not reasonable today, may, due to changed circumstances, cost etc, be reasonable tomorrow.

The duty relating to auxiliary aids and services – such as information on Braille, or a sign language interpreter – means that service providers have to take reasonable steps to provide an auxiliary aid or service if it would enable or facilitate the disabled person's use of the service. Service providers are not, however, required to do anything that would involve a permanent alteration to the physical fabric of premises when providing an auxiliary aid until 2004. Auxiliary aids and services might include signage in a building or colour contrast on the stairs. In addition, they may include the provision of specific products



Making historic buildings accessible poses a real challenge.

**Service providers have to anticipate the needs of disabled people in advance**

**Supermarket will be more interested in inclusively designed products that remove the necessity of additional service provision**



Age-friendly shopping trolley at Sainsbury's supermarket.

for disabled customers: for example, if a wheelchair user goes to a bank where signatures are required for documentation, but at present the counter cannot be reached, a lap tray might be supplied.

### **Education-related design**

Although originally excluded under the DDA, except for the requirement of accessibility statements in Part IV of the Act, education was later brought effectively back into the inclusion arena through SENDA 2001 with a distinction made between pre-16 and post-16 education. The legal drivers affect designers of school curricula and admission procedures, as much as extra-mural activities and the physical infrastructure. With changes in procurement routes by local authorities for school provision towards the Public Finance Initiative (PFI) and a drive by UK Government to increase school provision in the pre-16 sector there are some interesting developments in design briefs to take onboard inclusion in its widest sense.

The post-16 provisions in SENDA are more extensive and are phased similarly to the goods facilities and services provisions of the DDA. The timetable for implementation of SENDA runs behind the rest of the DDA. Both are being introduced incrementally, with alterations of physical features coming into force in 2004 for the DDA and 2005 for SENDA. Codes of Practice for both pre-16 and post-16 education are admissible as evidence and can be found at [www.drc-gb.org](http://www.drc-gb.org).

### **Products and goods-related design**

The manufacture and design of products and goods is not directly covered by the DDA because they are not in general provided directly to the public, and because the Act is concerned with the provision of the goods rather than the goods themselves. However the organisation that does supply the products to the public may be liable. An example given by the Code of Practice (2002) of a food processing company that produces tinned food that is then supplied to a supermarket chain is not covered by the DDA, whether it labels them with the supermarket's label or its own brand label.

The example goes on to suggest that the supermarket does have duties under the Act because it is supplying goods to the public, but these duties do not extend to the labelling or packaging of tinned food. Since the supermarket does need to provide an equal service to all

shoppers then it is likely to exert pressure on suppliers of the goods it stocks to ensure that wherever possible an inclusive approach is taken in their design. Additionally the supermarket will be more interested in inclusively designed products that remove the necessity of additional service provision to make them accessible and increase their consumer base. The Code of Practice does point out that it makes good business sense to design goods inclusively.

### Premises and built environment-related design

There is little connection on the face of it between the DDA's provisions and the UK Building Regulations that make specific provision for access for disabled people. Whilst the DDA deals with a person's individual rights the Building Regulations are written to control elements of building design and construction. The DDA is referred to in the notes of Part M of the Building Regulations and the recent introduction of a more comprehensive British Standard on accessibility (BS8300: 2001) has led to a consultation exercise with proposals to amend Part M that are primarily intended to reduce the discrepancies between what the DDA seeks to achieve and the minimum provision given in the Building Regulations. The new Part M is more than likely to bear a close resemblance to BS8300, although the elements on management of the building are likely to be omitted. The issue of policing compliance of a much stronger Building Regulation will prove difficult. Building Control Officers are the obvious contenders for this role, but few are experts in the area of inclusive design and they have many other aspects to cover in building inspections.

The situation in Scotland differs from England and Wales. The Scottish approach has been to disperse the information from their equivalent Building Regulation Part T into each of the relevant other parts and the Scottish Deemed to Satisfy Provisions. This means that there is no longer a Part T dealing specifically with access for disabled people in the Scottish regulations. Also unlike Part M the dispersal of access regulations in the Scottish approach means that it already applies to existing buildings.

The argument for dispersing the information to those other sections of Building Regulations lies in the social model of disability and also that there are no other sections in the Building Regulations that single out individual people, or groups of people. Instead the regulations



Design exclusion.

An inclusive building designer will need to investigate the client's activities, processes and employment issues to be able to deliver premises that avoid liability for the client

focus on building elements and therefore the architectural barriers to accessibility should be addressed in sections dealing with that element. The argument put against dispersal is that a separate document on access highlights the issue to architects, designers and builders. If the advice is in many different sections then it could lose its significance, or be easily overlooked.

The duty under the DDA goods facilities and services provisions relating to the physical features (for example, one arising from the design or construction of a building, or the approach or access to premises) in the DDA arises where a physical feature makes it impossible or unreasonably difficult for disabled persons to use a service. It is not the building per se that is liable under the DDA so much as its effect the building creates on the effectiveness of the service provided. In these circumstances, the service providers have to take reasonable steps to either:

- remove the feature;
- alter it so that it no longer has that effect;
- provide a reasonable means of avoiding the feature; or
- provide a reasonable alternative method of making the service in question available to disabled persons.

Whilst the first three provisions do not come into force until 1 October 2004, the fourth being already in place, the DDA does not prohibit compliance in advance of its implementation and, the Code of Practice positively encourages it. In particular, the Code says it will be good practice, and may make business sense, to take action to remove or alter a physical feature or provide a reasonable means of avoiding it before October 2004. Where service providers lease premises, the DDA overrides the terms of the lease to provide that alterations can be made to these premises with the landlord's consent, and that consent cannot be unreasonably withheld.

The DDA provides no definition of what is meant by 'reasonable steps' but regulations do make provision for the interaction between the duty to make adjustments and the Building Regulations. Whilst the Act does not define what is meant by a reasonable step, the Code of Practice lists some of the factors to be taken into account. These include the extent to which it is practicable for the service provider to take the steps and the financial and other costs of making the adjustment (the

costs to be taken into account include the costs as spread across the whole of the service provider's organisation).

Architects and building designers need to be constantly aware that even if their building design does not directly fall under the remit of the DDA or SENDA it may well form part of the process of the delivery of other activities by the client, or the rights of employees working for that client in the building and that these are covered by the Acts. An inclusive building designer will need to investigate the client's activities, processes and employment issues to be able to deliver premises that avoid liability for the client under these Acts.

## Summary

The legal argument put forward in this chapter could be perceived as seeking to limit design creativity. However, the authors would argue that the legal argument provides opportunity for design challenges and that the legal drivers are seeking to remove barriers and discriminatory situations. Designers should rise to the challenge and produce creative solutions.

Inclusive design avoids institutional aesthetics, instead favouring simplicity, and elegant solutions that work for everyone equally. The legal frameworks that are currently being put into place should assist designers to produce convincing arguments for their clients to adopt an inclusive approach in their commissions.



Facilities for disabled people are readily available at the Eden Project, Cornwall.

## Acknowledgements

Chapter title page: visually impaired people exploring sculpture at a touch-friendly exhibition in Japan, image by Julia Cassim; design exclusion image courtesy Matthias Hürlimann; Eden Project image Julia Cassim.

## Further reading

**BS8300 Code of practice (2001)** Design of buildings and their approaches to meet the needs of disabled people. [www.bsonline.techin dex.co.uk](http://www.bsonline.techin dex.co.uk)

**DDA (Disability Discrimination Act) (1995)** [www.uk-legislation.hmso.gov.uk/acts.htm](http://www.uk-legislation.hmso.gov.uk/acts.htm)

**DTI (2002)** Equality and diversity: the way ahead  
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**Race Relations Act (1976)**

[www.uk-legislation.hmso.gov.uk/acts.htm](http://www.uk-legislation.hmso.gov.uk/acts.htm)

**Sex Discrimination Act (1975)**

[www.uk-legislation.hmso.gov.uk/acts.htm](http://www.uk-legislation.hmso.gov.uk/acts.htm)

**SENDA (Special Educational Needs and Disability Act) (2001)**  
[www.uk-legislation.hmso.gov.uk/acts.htm](http://www.uk-legislation.hmso.gov.uk/acts.htm)

### Interpreting the laws

To help in the interpretation of the DDA and SENDA can be obtained at:  
[www.drc.org.uk/drc/informationandlegislation/page313.asp](http://www.drc.org.uk/drc/informationandlegislation/page313.asp)

## Chapter 9

# Inclusion – a commercial perspective

**Joanne Coy**  
Consignia



Royal Mail Group is an organisation employing over 200,000 people providing mail delivery, financial and retail services for the entire UK population; the organisation can only prosper in the future by ensuring that the real and changing needs of its large customer and employee populations are accommodated. Indeed, the new Chairman of Royal Mail Group, Allan Leighton, has made quality of service and the well being of employees a cornerstone of his plans for the re-shaping and renewal of the business. Improving the accessibility of work and services can be a vital factor in achieving these ends.

The financial and commercial arguments for improving the accessibility of the workplace are convincing; early medical retirement and long term absences are a major source of cost. Moreover, the demographic analyses of the European and UK populations lead us to expect that the workforce will be getting older in coming years and that accessibility in the workplace will become even more important. In this respect, accessibility requirement extends beyond the environment (buildings, facilities etc.) into the accessibility of work tasks themselves and the tools and information that people need to work effectively and with safety and comfort. Note that approximately 100,000 of Royal Mail Group's employees are frontline operational staff interacting with process machinery and computer systems.

Whilst reinvestment in processes and systems is considered to be a vital element in the regeneration of the organisation, there remains a great deal of legacy equipment and working environments designed many years ago. It is uneconomic and unrealistic to expect total renewal; legacy processes and plant will exist for many years. Despite an increasing trend for automation, it is realised that even in the most technology intensive work areas, people are of paramount importance in making the technology work and ensuring it delivers the benefits. The unmanned mail processing facility is still some way off, and not necessarily a desideratum.

Many process industries are now facing the fact that it is unrealistic to expect unmanned facilities even in next generation, automated systems (Yamada, 2002). Therefore the accommodation of people's needs in the process environment is of great importance. Indeed, many studies show that returns on investment in automated processes are considerably higher when automation strategies are developed in the context of ongoing, people centred continuous improvement

**Post Offices offer a wide range of services including pensions, benefit payments, bill payments, government services and an increasing number of financial and banking services**

programmes (Sim, 2001). The point deserves re-iteration: people are an essential element of automated processes and will be for many years to come; they are what makes automated process systems actually work.

However, when an organisation approaches the specification of new process and support systems the issue of accessibility still presents some difficulties. Currently, we are able to assess existing systems in an accessibility audit, but at this point it is often too late for significant changes, and the result may be less than ideal. There is a need to be able to implement an a priori accessibility specification. Employers, are aware that there is both a real requirement, and an obligation under law, but the means of translating this requirement into a clear and unambiguous specification that would drive suppliers to implement design methods to improve accessibility, is not clear.

Also, in situations where it is sought to maximise the benefits from legacy equipment and systems, front line workers are in many cases the people best equipped to advise upon where change is needed to improve working conditions and accommodate their needs. Indeed, given the opportunity to contribute, frontline people are often a primary source of solutions. The addition of a framework and specific expert help could help those workers bring about changes that make the workplace both safer and more accessible.

As a provider of services, Royal Mail (Post Office) also realises that the ageing population must influence its long-term strategy regarding how services are to be delivered to the public. Post Offices offer a wide range of services including pensions, benefit payments, bill payments, government services and an increasing number of financial and banking services. More-over, in many rural communities, Post Offices provide the only shop within reasonable access and provide a real point of focus for the community. Every week some 28 million people visit a Post Office. Given that such a large proportion of the population actually depend upon Post Offices, it is important that service accessibility is based upon real population data and analysis and that the means of accessing the relevant services has been designed and devised in accordance with the data. This point again raises the issue of how an accessibility specification is to be relayed to suppliers.

This chapter sets out to explain why assistive technology and design for accessibility are important to a large organisation such as Royal Mail Group, both from the perspective of an employer and of a provider

of services. The requirements of the law and the very real business benefits of provision are outlined. Also, the context into which assistive technology and recently developed inclusive/accessibility related design methods can be applied are explained together with the consequent barriers and the mechanisms by which Royal Mail and other large process based organisations could potentially drive forward change.

## **Drivers for change: the employers perspective**

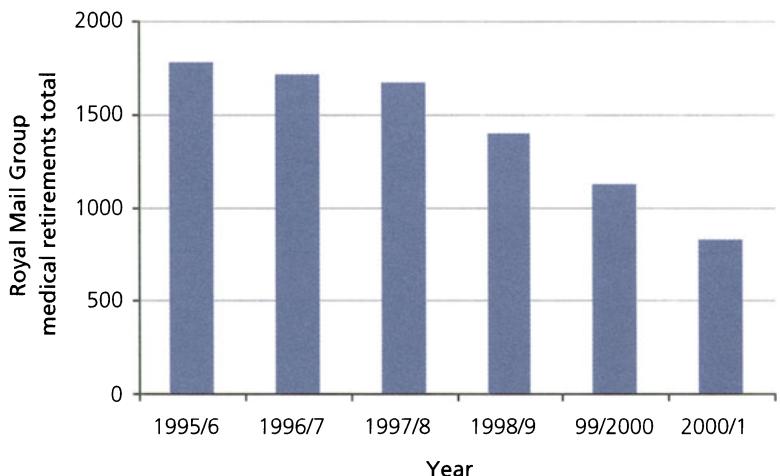
### **Legal imperatives**

In the UK, the Disability Discrimination Act 1995 (DDA, 1995) and equivalent acts such as the Americans with Disabilities Act (ADA, 1990) place clear requirements upon employers to make adjustments to the workplace in order to create opportunities for people with disabilities. The DDA stipulates that for major employers, the workforce shall include some 3% of employees with physical impairments and that the workplace must not present unnecessary obstacles to employment opportunities. More specifically, the DDA requires that where any physical feature of premises occupied by the employer, or any arrangements made by or on behalf of the employer, causes a substantial disadvantage to a disabled person compared with non-disabled people, an employer has to take such steps as it is reasonable for him to have to take in all the circumstances to prevent that disadvantage - in other words the employer has to make "reasonable adjustments".

### **Commercial incentives**

Simply, failure to recruit people with disabilities and to provide an accessible workplace is to deprive an organisation of a pool of talent and skills that could be of great benefit. Moreover, failure to provide an accessible workplace also results in both a loss of staff who develop physical impairments during the course of their careers and long periods of absence from the workplace during recovery from illness or injury; these scenarios are where significant costs are incurred. Figure 9.1 (overleaf) shows the number of people within Royal Mail Group that have been retired on medical grounds on an annual basis.

The costs of pension fund contributions and administration amount to some £80k per person; in previous years, the annual cost of early retirement on medical grounds has exceeded £120 million, but as the data illustrate, at least some impact has been made in keeping people in



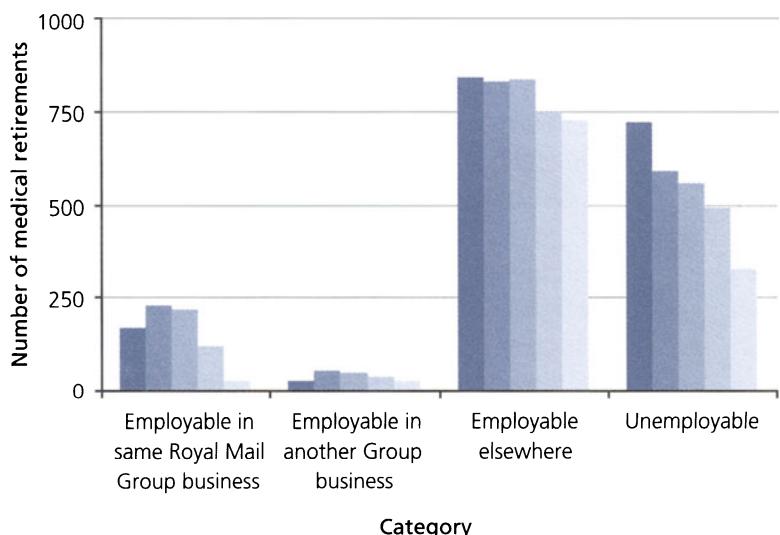
### 9.1 Early retirements

Royal Main Group medical requirements totals from 1995 to 2001.

work, however the costs are still above £60 million. This figure is not inclusive of the costs of recruitment and training to re-fill the vacant posts. An analysis of these people and their conditions to ascertain the potential for re-deployment is shown in Figure 9.2.

It is clear that substantial savings could be made if the workplace was more accessible to the people described by the first three categories. However, it must be noted that the costs of early medical retirement are significantly superseded by those of long-term absence;

■ 1995/6 ■ 1996/7 ■ 1997/8 ■ 1998/9 ■ 99/2000

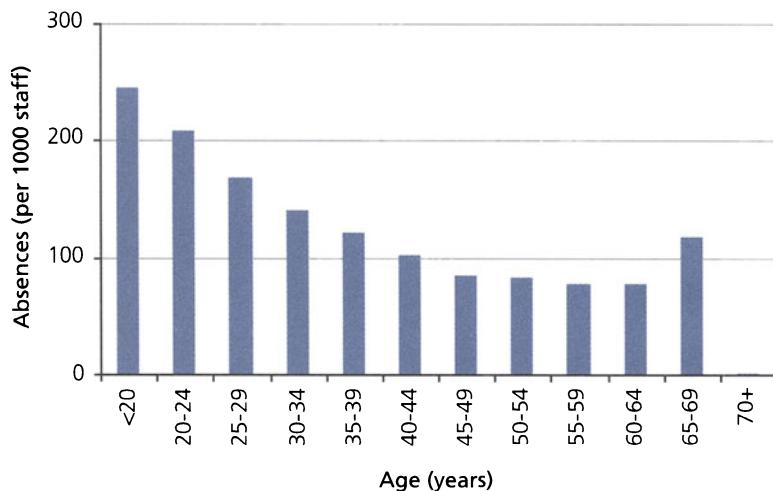


### 9.2 Retirement categories

Royal Mail Group medical retirements by category.

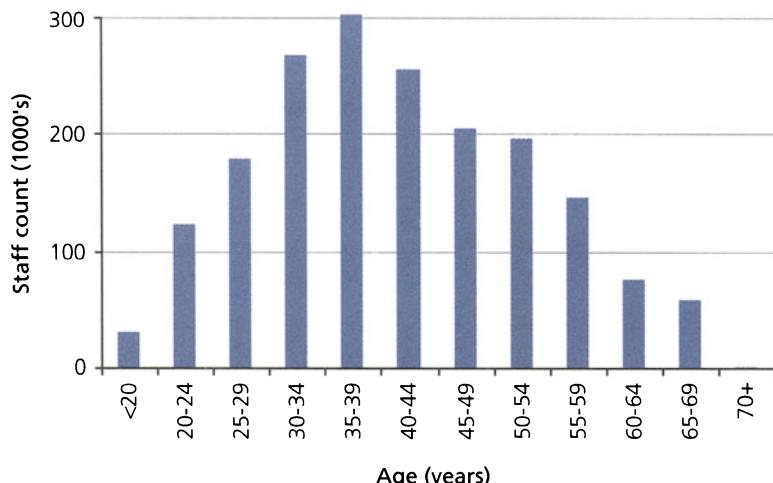
the costs to Royal Mail Group per annum are currently approximately £160 million. Technology and design practices for a more accessible work environment, rehabilitation and flexible working could clearly provide substantial benefits.

Royal Mail Group's data indicate that employers may also benefit from considering a direct policy of employing more older and disabled people: they are better value. The statistics consistently show that older employees take less sickness leave than their younger colleagues. Figure 9.3 shows the absences per 1000 staff over the one year (2000-2001), which is not exceptional. These statistics show, that providing



### 9.3 Absences

Absences per 1000 staff against age.



### 9.4 Staff profile

Royal Mail Group staff age profile.

appropriate workplace adjustments can be made to accommodate the needs of older people, employers could benefit from a significant impact that can be made on the substantial costs of absences.

Figure 9.4 shows the age profile of Royal Mail Group's workforce. Despite the fact of their reliability, the over 50's still account for less than one quarter of the workforce. Demographic drivers aside, it is clear that there are gains to be accrued by employing more people in this age bracket where possible.

### The development of design practices

There has been an evolution of the design practices that are devised to improve accessibility. A number of approaches have been developed which are distinguished by target user group and how they aim to accommodate accessibility. These approaches include:

- Rehabilitation design (Hewer et al., 1995)
- Design by story-telling (Hewer et al., 1995)
- Transgenerational design (Pirkle, 1993)
- Universal design (Hewer et al., 1995)
- User pyramid design approach (Benktzon, 1993)

Together, the above approaches encompass design practices to accommodate the whole population, individually, they do not. Recent approaches have sought to combine the best elements of these methods in a quantified system for designing for target populations (Keates and Clarkson, 2002a; 2002b). With this approach it is also possible to assess the inclusive merit of designs based upon detailed data regarding the characteristics of the UK population (Clarkson and Keates, 2002). With this recent work, the fundamental information for a quantified approach to design for accessibility has now been collated and the well-considered design tools now exist in order to move forward. However, there remains a question of how an employer or service provider can ensure these tools are used to reap the maximum benefit for the business, and its employees and customers.

### Mechanisms for change in the workplace

As previously discussed, improving the accessibility of work tasks and the work environment is potentially a means of reducing operational cost by reducing the incidence of early retirements and long term

absences. There are potentially two mechanisms by which 'Inclusive' design practices can be applied to achieve change:

- In the specification of new systems: process plant, support systems, and environments.
- In the improvement of existing and legacy equipment and the environment in which it operates.

In a similar way to most process based industries, Royal Mail considers that continued investment in automation is a *sine qua non* for the short and long term viability of its business. However, total renewal of the entire mail processing network is essentially a long term prospect. Therefore, existing plant will be used for some considerable time.

The application of Inclusive design practices could be considered to be at an impasse. During the 'Include' project, an investigation was performed in order to identify some of the barriers to designers taking up inclusive design practices. One of the primary barriers can be characterised by the comment, "We'll do it when the customers ask for it." However, the idea of being able to give a 'specification' for accessibility is new to the customer, and there are currently no precedents that can be used for guidance. It is usual for organisation to have considerable expertise in the technology areas in which it specifies systems, for example, Royal Mail have a wealth of knowledge of mail processing plant and what mail processing functionality and performance may be reasonably expected from it.

Specification of any element of a large complex system requires knowledge of how to derive the requirement from an analytical basis, how to express the requirement with clarity and without ambiguity, and how to validate the resulting system against the requirement. Although Royal Mail also has some expertise in ergonomics and a substantial amount of data concerning its employees it does not amount to expertise in the specification of accessibility. Many other organisations are probably some way behind even this stage. Therefore, in order to begin the process of specification, guidance would be needed thus:

- What are the analytical means to determine what the organisation's requirements actually are?
- What data does an employer need to gather regarding its workforce?

**We'll do it when the  
customers ask for it**

- What does the customer actually specify to the potential supplier for the specification to have sufficient clear and specific meaning?
- How are the relevant aspects of accessibility represented, e.g. x% of a target population should be able to perform each task in the given time without significant physical or mental stress?
- What information does the customer have to supply to the supplier about its current and projected workforce?

Firstly, it would be extremely useful to have access to a guide that would identify the information and methods that could be used to identify the requirement. Specifically:

- How to derive and represent the target population.
- What is the reference data for translating the defined target population into a set of physical characteristics? Equipment can have a service life of 15 or more years, is there a reference data source that is regularly updated and offers trend based projection over the coming 20 years? Alternatively, would a customer have to provide this information to its supplier based upon its own analysis? Royal Mail has access to detailed information; many other organisations are not so well placed.
- How is a target population actually defined? For example, is a distribution of age, gender and expected conditions beyond that expected from general population data? (For example it is known that Royal Mail staff have a higher incidence of post accident trauma and arthritis than the general population).
- How is ‘accessibility’ defined in relation to this target population? The metric of ‘Inclusive Merit’ (Clarkson and Keates, 2002) is an excellent start, but how would the requirement translate into this parameter?
- What relevant details regarding the environment in which the system is to be used must also be given to potential suppliers?

When a requirement has been clearly defined, the task of specification falls to a non specialist purchasing engineer who then has to relay the specification through the supplier’s sales engineers. It is an important point that specifications for an automated process system are commonly made in terms of a functional requirement rather than a particular system design. The supplier then has the job of designing the system to

meet the functionality. This means that it is not possible or appropriate for the customer to specify accessibility requirements in relation to elements of a design. Organisational and geographic distance also adds to the difficulties: Almost all of Royal Mail's automation suppliers are based outside the UK and in all cases, there is rarely an opportunity for design or ergonomics specialists from both sides to discuss the details of design between themselves. Moreover, suppliers of automated systems tend to be large multinationals, with several layers of people between the sales engineers and the engineer who actually has to act upon the specification; also they often have layers of smaller specialist sub contractors. As with many forms of specification, there is plenty of scope for misinterpretation in the chain of supply. Relaying accessibility requirements through such a chain would be problematic without recognised common nomenclature and definitions.

A process for reviewing the inclusive merits for an individual design has been set out (Clarkson and Keates, 2002). But in the context of the specification of large systems, there would be a considerable resource burden in reviewing each element of the system design and the 'task path' through the system in this way without an *a priori* guideline to the design of the system and the individual elements within it. Such a guideline, in the first instance, need consist of little more than a look-up table or database with identified sensor, motor and cognitive requirements and related design impact and restrictions. For example, if it is desired to design a system for a population with a high incidence of arthritis, potential areas of impact could be highlighted, including lifting, handling materials and data entry, and the guideline could then give guidance on potential low cost solutions and ergonomic restrictions.

When a design is complete, and a functional prototype exists, there remains the issue of 'sign off'. The customer began with a functional specification; it then remains to either the supplier to prove that the specification has been met, or for the customer to perform validation tests. Either way, a guideline is needed for evaluating the end product in relation to the initial accessibility requirement. A suite of tools and guidelines for the process of requirements assessment, specification, translation, design guidance and validation needs to be brought together into a coherent, readily accessible package. Also, as most engineers are aware, in order for specifications and methods to be

unambiguous, transferable and consistent between sites and between different organisations, it is necessary to reference internationally recognised standards. A national or ISO standard for inclusive design or design for accessibility must be considered to be the logical end point of the development of inclusive design practices. Such a course would also be a valuable means of promoting much needed awareness of the issue among the engineering and design communities.

### Legacy process systems and environments

Another of the key initiative in the renewal of Royal Mail is to be the empowerment of frontline workers to make improvements. This idea is scarcely new, indeed it has been an essential element in the development of the manufacturing industry over the past 30 years. Direct participation in the working environment has been proven to be beneficial: The European Foundation for the Improvement of Living and Working Conditions (European Foundation, 1999) reports that direct participation in organisations leads to:

- Quality improvements in 90% of cases.
- Reduction of throughput times in 60% of cases.
- Reduction of costs in 60% of cases.

Participation is also a major factor in job satisfaction. Participation is often effected in the workplace by Continuous Improvement (Kaizen) type programmes in which workers are actively encouraged to identify problems and difficulties in the workplace, suggest solutions and are empowered to act upon them. In terms of identifying problem areas, assessing work tasks for safety, physical and cognitive loads, stress and ease of access, front line workers are the best source of information, and are often the best source of solutions.

The idea of providing ergonomic tools and expert help for participative continuous improvement programmes is not new (Eijnden et al., 2002). The provision of a similar approach with accessibility related ergonomics tools, requirements and information could provide a fruitful means of applying the inclusive design methods on a widespread basis. If workers could see the impact of one potential solution against another on accessibility, then they could direct their efforts to the best possible effect.

## Drivers for change in the service environment

As a provider of services, there are legal and clear commercial drivers for the application of design practices that will improve accessibility for the entire population.

### Legal imperatives

The Disability Discrimination Act 1995 (DDA, 1995) is clear in its stipulation. From 2004, service providers will also have to make 'reasonable adjustments' to the physical features of their premises to overcome physical barriers to access.

The Code of Practice (DDA, 1999) states that reasonable adjustments include an obligation to:

...provide an auxiliary aid or service if it would enable (or make it easier for) disabled people to make use of services.

Moreover, it is stated that:

It is more likely to be reasonable for a service provider with substantial financial resources to have to make an adjustment with a significant cost than for a service provider with fewer resources. The resources available to the service provider as a whole are likely to be taken into account as well as other calls on those resources. Where the resources of the service provider are spread across more than one business unit or profit centre, the calls on them all are likely to be taken into account in assessing reasonableness.

The COP defines auxiliary aids; stating that technological solutions are a way forward in facilitating aid:

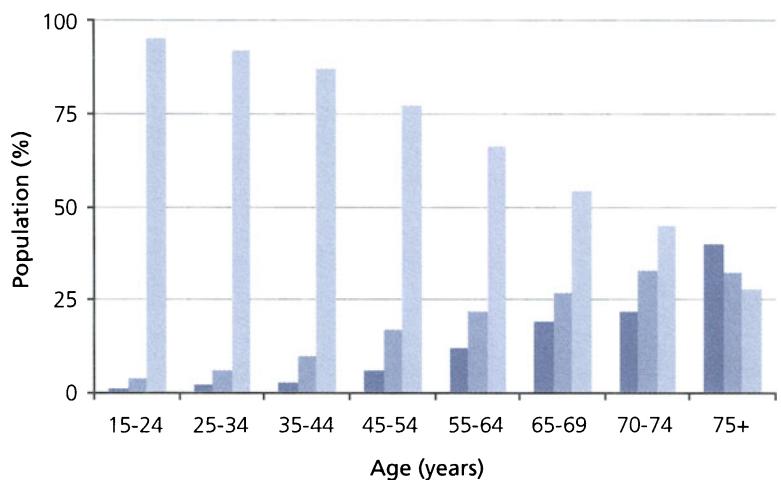
An auxiliary aid or service might be the provision of a special piece of equipment or simply extra assistance to disabled people from (perhaps specially trained) staff. In some cases a technological solution might be available.

Further, the COP states that the duty for provision is ongoing; it is necessary to undertake a programme of continuous development, and it is expected that technology will be used in improving provisions.

The combined effect of these stipulations implies that a large organisation such as Royal Mail Group is expected to exceed the efforts of most organisations. Where facilitating access to a service may involve the application of auxiliary aids; it is expected that larger organisations

will commit to a higher level of provision and thus more investment in such aids. The interpretation of ‘reasonable’ is also dependent upon prior art; if one service provider has implemented a solution, others are of similar size and means, are, to some extent legally obliged to follow.

■ Severe physical impairment ■ Physical impairment ■ No significant impairment



## 9.5 Impairments

Physical impairment as a function of age

## Commercial incentives

The customer base of Royal Mail Group and its Post Office network is the entire UK population. The approach towards improving accessibility must encompass people with single major disabilities and people with multiple minor disabilities such as older people. In this context, the demographic trends in the UK and Europe are worthy of consideration. The population is ageing: studies show that by 2021 half the adult population in the UK will be over 50 (Coleman, 1993). European studies show that by 2020, 25% of the European population will be over 60 years old, compared with 18% in 1990. The largest growing age sector are the over 80s which currently constitute 3% of the population: this figure will double over the next 20 years which means that there will be some 18 million over 80s in Europe (Ballabio, 1998).

Thus, it is reasonable to anticipate that older people will become an increasingly significant part of the customer base of all service providers. It is known that increased age is inextricably linked to increasing physical functional limitation, see Figure 9.5. (Vanderheiden, 1990), and possible to demonstrate that in the coming years there will be an increasing need to make services more accessible. In order

for Royal Mail Group to thrive as a provider of services, this enhanced level of accessibility must be delivered in a way that is cost effective. Moreover, some clients (large organisations who use Royal Mail Group/ Post Offices to deliver their services), including the government, are specifically requesting that their services be accessed electronically. It is clear that technology based solutions must be employed to deliver more services in the future and that the design aspect of accessing services will be of increasing importance.

However, these drivers should not be viewed as a threat, but as a stimulus: in the provision of services, technology provides the opportunity, not merely to maintain quality of service, but to extend it, enhance it and add value in a way that has not previously been possible: Multi modal interfaces, computational linguistics and image generation techniques such as avatars give opportunities for ensuring that information and transactions can be conveyed in a wide range of accessible formats and will extend the availability of services in terms of time and location, e.g. the 24 hour service kiosk. Similarly the internet will increasingly bring more services into people's homes in flexible formats. It must be noted that where transactions and information are to be delivered in public spaces (such as Post Offices) the environment imposes further restrictions and requirements for robustness and careful consideration; e.g. speech and aural media can become difficult in a noisy retail space. Further constraints are imposed by floor space return requirements and achieving an integrated functional flow-through in the retail and transaction area (Coy et al., 2001).

Accessibility 'on the other side of the counter' must also be considered. Counter clerks account for approximately 25,000 staff. If a counter clerk is not entirely comfortable and confident with a piece of technology, or the design of an item adds to the workload or difficulty of tasks, then the solution will fall into disuse. The requirements of the implementer of technologies must be considered to be as important as those of the customer in designing for accessibility.

## Mechanisms for implementation

Specifying devices for use in the customer service domain brings a broadly similar set of requirements to those discussed for application in the workplace. However, the supplier base for service environment systems is far more diverse than that for large scale process automation.

Often, small and medium sized companies supply particular items. These companies normally have very limited in-house design and design analysis resource. Therefore, application of accessibility design tools cannot demand significant overhead in the design process. Minimising the design overhead relates to minimising the number of design iterations to fulfil requirements; here again the a priori accessibility design constraints and solutions guideline would be beneficial. Where the individual elements of an environment have been supplied from a diverse base, it is again essential that there is uniformity in the interpretation and approach to accessible design. This consistency of approach could only be achieved through the reference to and implementation of recognised standards for design.

**During the writing of this paper, the British Standards Institution agreed a proposal for a new standard provisionally titled BS7000-6: 2003 Design Management Systems- Inclusive Design.**

## Summary

As we have seen, there are potentially highly significant benefits for industry in improving the accessibility of the work place and the point at which it delivers its goods or services to the public. Employers and service providers stand to gain significantly from the effective implementation of technology based solutions, inclusive design and design for accessibility practices. Whilst appropriate design tools and methods have now been developed, there remains the problem of how these tools are to achieve best possible take up. Published literature may have an influence upon a number of designers, but the effect would be non-uniform and penetration gradual. If more definitive action is taken by those who drive designers – the customers – to include the issue of accessibility in their specifications then take up will inevitably be the more pervasive. In order for organisations to bring this idea into reality, it is necessary to have access to, and refer to recognised guidelines of practice.

There are also opportunities for effecting change in organisations by taking advantage of the mechanisms that are already in place for that purpose. Participative, continuous improvement programmes are increasingly common, and front line workers often have the domain knowledge that will enable or ensure that solutions (in the workplace) are fit for purpose; tools aligned to these processes are potentially an excellent means of ensuring that inclusive design practices reap real benefits.

## Further reading

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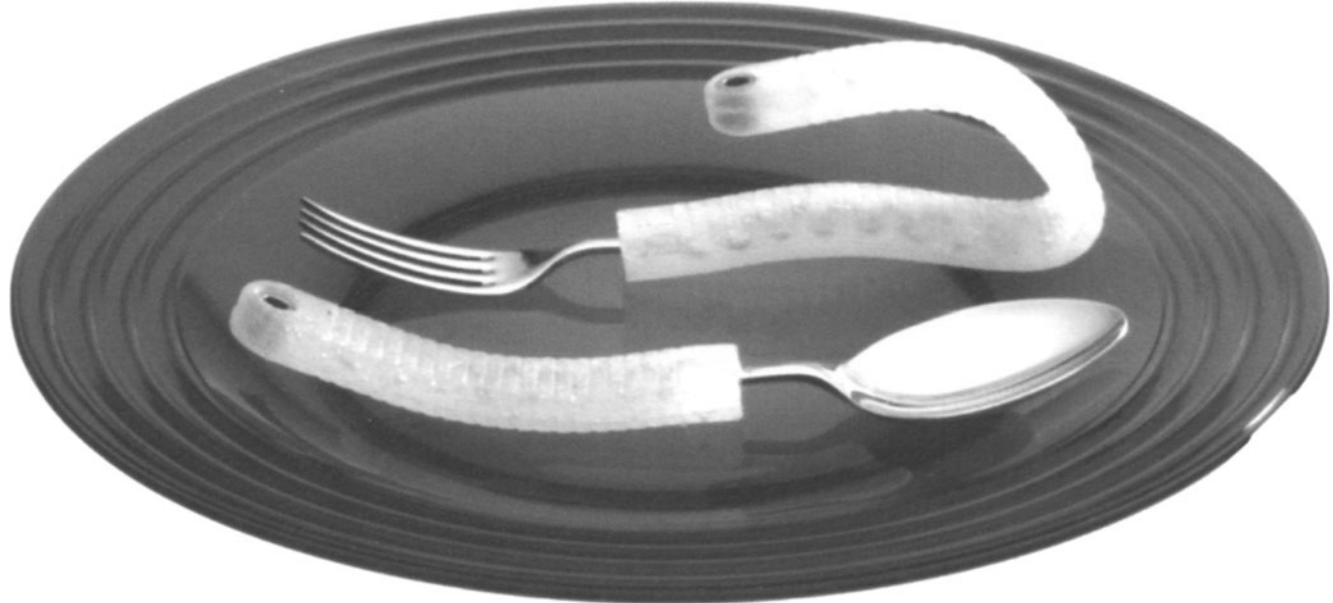
Chapter title page photograph:  
Tim Parsons, Helen Hamlyn  
Research Centre

## Chapter 10

# Inclusive design or assistive technology

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This chapter considers the future of assistive technology, particularly in view of the effects of the universal design paradigm on mainstream design practice, and the inclusion of more ‘assistive techniques’ within the design of mainstream products. These trends could be thought to put the markets for assistive technology at risk. In contrast, however, the trends that led to the universal design agenda could also provide increasing market share for the assistive technology industries. In order to benefit from these trends, however, there need to be major changes in the way sections of the industry performs.

Please note that in this chapter, a number of generalisations about the assistive technology Industry are made, many of which are not true for the whole industry. The author is fully aware that his criticisms do not apply to many companies within the industry, but has done this in order to simplify his message. He hopes that the far-sighted companies in this field will excuse him and all will learn something from these perceptions.

### The medical model of assistive technology

Assistive and mainstream technology are usually considered as separate market segments, with assistive technology being primarily a subset of rehabilitation engineering. In other words, assistive technology is primarily associated with either short-term recuperation from injury or illness, or long-term functional support.

As is discussed in a later chapter by the same author, there was a move in the early 1990s to encourage mainstream designers to consider a wider user group for their products. This move was prompted by both legislation, such as the 1990 Americans with Disabilities Act (ADA, 1990) and the 1995 UK Disability Discrimination Act (DDA, 1995) and also a recognition of the demographic changes of the population becoming older.

The move to consider a wider range of users was articulated as a ‘universal design’ or ‘design for all’ agenda. It was based on the assumption that mainstream designers could learn from the experiences of designers of assistive technology in responding to the particular design needs of disabled users, and thus be able to design products for all users, including disabled people. The principal motivation of the universal design agenda was to increase the range of people who could use mainstream products. The essential idea was that mainstream

A true design for all philosophy would imply that there was no need for assistive technology

products should either directly cater for ‘everyone’, without the need for modification or adaptation, or that accessibility ‘hooks’ should be built into all mainstream products to support specialised access equipment.

A true design for all philosophy would imply that there was no need for assistive technology as mainstream products would cater for the needs and capabilities of all users. Even without this (impossible) dream, however, it seemed that the move towards inclusive mainstream products would leave assistive technology as an even more fringe activity than it had been in the past, and one with a very strong health/rehabilitation flavour. This essentially follows the medical model of disability where products are designed primarily to provide for the special needs of people with disabilities. This model implies the development of high cost specialised pieces of equipment for decreasing markets. The equipment would be marketed to health or social work services, and would be designed mainly for use within an institutionalised setting, such as a hospital or care home.

When following this medical model, designers of assistive technology tend to think of the people for whom they are designing not as 'users' or 'consumers', but as 'clients' or 'patients', and the true 'customer' as a government agency. The assistive technology industry has also often considered its 'clients' to be economically poor and politically powerless, using equipment which is procured for them either by government agencies or charitable bodies. The clients are rarely seen as the customer, because, they neither paid for their equipment nor had a major say in the choice of the equipment purchased.

The medical model of assistive technology, however, is a backward looking model and continuing to follow it will lead to significant opportunities for the field of assistive technology being missed. Combined with the loss of market segments, as universal design produces more desirable and accessible products, this could lead to an industry in crisis.

## A future outside the medical model

However, this need not happen. There is an opposing, and more optimistic, view of assistive technology markets in the future. As has been indicated in other parts of this book, demography, the wealth and

disposable incomes of older people, and legislation in the developed world, means that 'older and disabled people' are now seen to be an important growth market. The obvious conclusion from this is that mainstream equipment should be designed to be usable by these groups of people. These changes, however, could also lead to a substantially increasing market for assistive technology products. In order for the assistive technology sector to take full advantage of these opportunities, the attitudes of mind of some of those working in the sector needs to change.

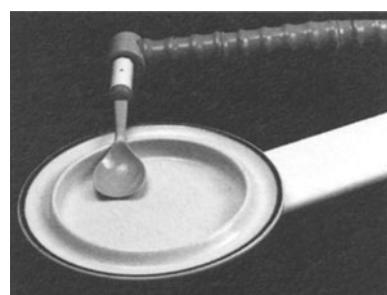
In the same way as the universal design movement recommends mainstream design should include a consideration of 'all users', the assistive technology sector should extend its appeal towards 'all users'. Design for all in its true sense, i.e. one product for all, is virtually impossible, so there is always going to be a need for specialised accessibility features and equipment, and also for equipment which has been designed primarily for an impaired user. Both of these markets are potentially expanding markets.

The assistive technology industry should become more like mainstream industry and think of the people for whom they are designing not as clients or patients, but as customers, consumers, citizens, or even people. This will not only give the potential user population more dignity, but also implies a very different relationship between provider and user than is customary in medical models, where the users are regarded as people to whom 'something is done to cure them'. Thus, by changing the perception of the users, they become more important and the commercial imperative will consequently change to become production of what the users want, rather than what someone else (be they carers, prescribers or therapists) believes the users need.

### The changing marketplace

Designers of assistive technology should also respond to the effects of the changing demographics of their user base. The population is getting older. No longer will the majority of users be young people with a single disability, but they will be older people with multiple minor disabilities over which a major disability may or may not be superimposed. They will also have different lifestyles and different needs to those of younger disabled people. Many will still be

**One product for all, is virtually impossible, so there is always going to be a need for specialised accessibility features and equipment**



Jay Michaelis demonstrating his 'Neater Eater' which makes it possible for people with intention tremor to feed themselves without assistance.

This group of users can change more rapidly with time and the ageing process than is the case for younger disabled people

economically active, and some may have a major role in caring for another older and possibly disabled person. The special needs of older people include more emphasis on:

- safety and security in the home,
- assessment, monitoring and support, and maintenance of function
- support for memory loss and dementia
- reduction of social isolation
- provision of entertainment and leisure
- support to remain economically active.

The demography of the 'traditional' disabled customer is also changing. Increased life-span and better medical care mean that many more people who have been disabled for all, or a majority, of their lives, are showing the symptoms of ageing. There are higher levels of sensory and cognitive dysfunction, and different user motivations within this user group. In addition, the functionality and characteristics of this group of users can change more rapidly with time and the ageing process than is the case for younger disabled people.

Thus there is a need for a new design paradigm, which takes into account the increased diversity of the user population, and the changes which occur in their characteristics. This concept is being investigated within the UTOPIA (Usable Technology for Older People: Inclusive and Appropriate) project

This is a joint project of four Scottish Universities, led by the University of Dundee, which is developing methodologies for Scottish industry that encourage the recognition and consequent inclusion of older and disabled people within different market segments. While focusing primarily on the needs of mainstream industry, the findings of the UTOPIA group are just as valuable to assistive technology industries as to mainstream industry.

Principal findings include the need for direct and continuous contact with older and disabled people in a variety of roles such as experimental subjects, members of the research and development team, within project advisory groups, and as 'test pilots' for prototype systems.

## Who is the customer

### The differences between needs and wants

The fact that the typical user of assistive technology was not usually the purchaser may have had a major influence on equipment design. Assistive technology often has an institutional 'air' about it - being more suited to a hospital ward than to a living room. It is interesting to note that, in the Christmas season, very many consumer durables are not purchased by the eventual user. This does not produce obvious design changes in the products, however, and this is perhaps because the purchasers of Christmas presents are, in general, trying to buy what they think the recipient might want rather than what they need, as an act of generosity rather than a charitable gesture.

The difference between 'need' and 'want' has very important effects particularly regarding the aesthetics of equipment. Those things we want usually are beautiful – in the eyes of the purchaser at least. Those products which it has been determined – by others – that we 'need', do not have the same requirement to be beautiful as their functionality is considered to be of utmost importance. However, this need not be the case. There is no absolute reason why assistive technology devices should be ugly. They probably end up like this because of the lack of motivation of designers to design beautiful products for the rehabilitation market, and, either the reluctance to employ designers with visual awareness, or to allow such designers to consider aesthetics as an important part of their remit.

As a proponent of the importance of the 'usability' of products, I usually extol the virtues of function over form – many designers in the rehabilitation and assistive technology fields, however, seem not to have any concept of 'form' to the major detriment of the popularity of their products.

Assistive technology designers should listen to their users more and find out what they really want. Much of the assistive technology equipment prescribed to users ends up languishing, unused, in cupboards. There is a need to understand why such equipment, that is supposed to be useful for the users, is not being used.

It is not always obvious that all assistive technology manufacturers are fully aware that understanding why the technology is not popular or commonly used, should a part of the design cycle for a new product.

**Those things we want usually are beautiful – in the eyes of the purchaser at least**



Shopping made easy with the 'Ticker'  
by Marcus Hohl, RCA Industrial Design  
Engineering.

**We have forgotten that there are alternatives to a youth-oriented approach**



Proposal for a programmable medication management product: Indes Design.

## Aesthetics and AT as a fashion statement

These criticisms, of course, are not universally true. For example, most hearing aid manufacturers focus on 'form' as well as function. In this case 'form' usually implies invisibility and many hearing aids are designed to be as unobtrusive as possible, often at the expense of functionality and usability. These manufacturers, however, are fully aware of the preferences of their customers.

Indeed, the design of hearing aids highlights the differences that the perception of who the 'customer' is has on design. For instance, hearing aids designed for, and distributed by, the UK National Health Service are often larger and a more obvious 'aid' than those supplied directly to private customers. The private market has led the field for smaller and more discrete aids, first of all focusing on 'behind the ear' aids and, more recently, 'in the ear' aids.

Current assistive technology is not considered to be a fashion accessory, but demographic changes are likely to produce the need for incorporating aesthetic design within products. This will favour those assistive technology designers who are fastest to respond to the true needs and wants of the users.

The UK and many other societies in the developed world have promoted youth and its virtues for a long time. Industries have made large profits by pandering to this aspect of society. It may even be claimed that we have forgotten that there are alternatives to a youth-oriented approach, such as one where the wisdom of age is respected, and it is not embarrassing to admit that one is older or infirm.

There have been times when areas of fashion were particularly beneficial to older users. In Victorian times, the walking stick was a fashion accessory for many (and also could even serve as a repository for hard liquor and a weapon of defence/attack). In those days one could easily purchase a wide variety of very beautiful walking sticks, and using a stick was a badge of honour rather than shame. This is still true for country-walking enthusiasts, but there is little cross linkage between design of walking sticks for outdoor pursuits and those intended for therapeutic purposes.

There are also moves towards efficient artificial legs as a fashion statement, rather than the design being compromised in an attempt to make them 'cosmetic', i.e. conceal that they are artificial, and 'cool'

wheelchairs for children. BT, a mainstream telecoms company, designed a telephone specifically for older and disabled people, which became a very successful mainstream product. Part of its success was probably due to it being neither ugly, nor marketed as a piece of assistive technology.

The questions that the assistive technology industry needs to address include:

- Should assistive technology 'delight' the user (and their friends and companions)?
- What is most appropriate way to do market research in this field?
- What is the best way to market assistive technology products to a wider group?
- How can one best obtain accurate feedback from current users (including but not exclusively their professional carers)?

Example detailed questions concerning design could be along the lines of:

- What are the concepts of ugliness applied to artificial limbs? Is this likely to change? Should an artificial hand look cosmetic, or be functional?
- Can and should alarm call buttons be designed as a fashion accessory?
- Would remote controlled curtains, with a beautiful control panel, add to everyone's home?
- Most bath rails look as if they were designed for the hospital ward, and thus have no place in ones own bathroom. Is there a market for a 'designer' bath rail?

### What are the concepts of ugliness applied to artificial limbs?

## Assistive technology for all

In responding appropriately to these challenges, the assistive technology industry could make great inroads into traditional mainstream product markets. This has happened, and my later chapter in this book gives examples of equipment, which were at first designed for people with disabilities, becoming popular mainstream products. Other such products include the Water Bed, which was first designed for rehabilitation. Such companies as Possum (significantly standing for 'Patient' Operated Selector Mechanism) pioneered the remote control of domestic equipment. Research into simple e-mail systems for old

### How can I increase the beauty of my product without too great a cost penalty?

people produced an application which was preferred by executives over their standard e-mail system.

The assistive technology industry will never be really successful while it sticks to the medical model, because there is always a greater thrust towards, and resources available for, towards cure rather than care within the medical model. The domestic product market, however, is entirely devoted to providing 'support for daily living', and the methodology used in this market place, is more suited, I believe, to assistive technology of the future.

Designers of assistive technology need to consider what compromises should be made between:

- low cost and high quality
- institutionalised versus personalised design, and
- requirements of the user rather than the service provider

Developers of assistive technology need to think in a more generic way and ask questions such as:

- How can I increase the potential market for my products?
- What other groups of users may find it beneficial?
- How can I increase the beauty of my product without too great a cost penalty?
- How can I market it successfully to this increased range of potential users?
- What lessons can I learn from mainstream design to improve my sales?
- How do I design successfully for people rather than clients?

### Summary

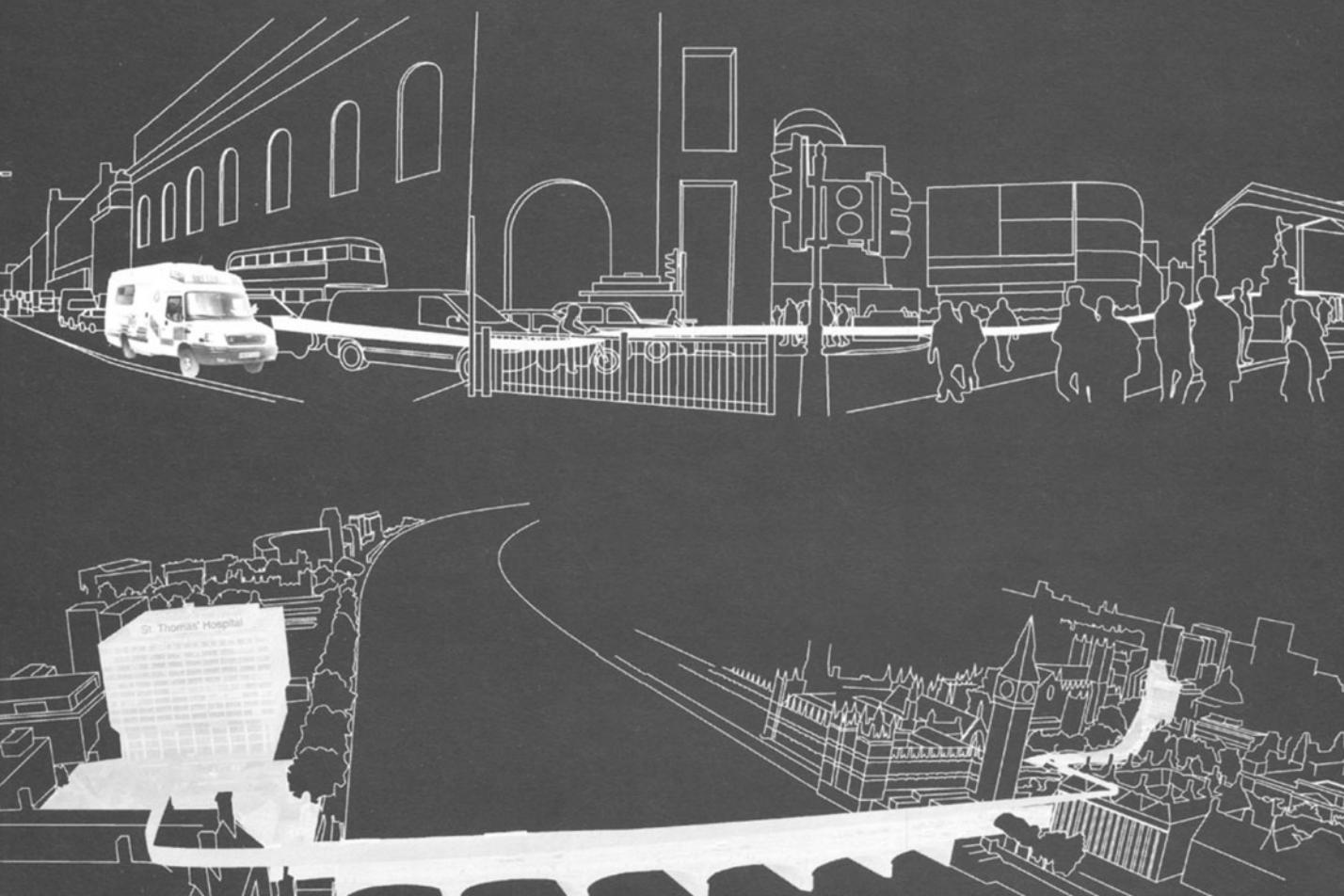
Older people constitute a growing market segment, and the characteristics of the market of people with disabilities are changing. The changes in the demography of the developed world will change perceptions and markets for traditional assistive technology. The assistive technology industry can benefit from these trends, and can provide improved design for 'everyone'. It must, however, adopt the appropriate frame of mind, be focussed on the actual characteristics of its potential customers, rather than stereotypes, be aware of the importance of

aesthetics and good visual design, and use appropriate marketing techniques. Over and above all this, it should ensure that it includes older and disabled people fully in the design process.

## Chapter 11

# Humanising technology

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In the future we will have a population with a much more diverse profile of capabilities – physical, sensorial, and cognitive – than that of today, accompanied by different lifestyle patterns for work, leisure, living and social interaction, and with diverse socially and culturally induced needs and desires. The extent to which technology will mediate for our greater individual wellbeing through products and services that satisfy our physical and emotional needs across the changing age range is the real issue under discussion in the following chapter. We are an inventive and adaptable biological species with deep socio-cultural and spiritual needs and desires that lives largely, in the developed world, in a ‘technosphere’, a synthesised artificial world of our own making. How do we reconcile our many individual corporeal, social and spiritual needs in facing the challenge of delivering ‘inclusive’ design in an era of rapid technological change which will also see profound changes in population demographics and lifestyles in the next twenty years?

If the applications of technology are to be considered humane, then we need to reassess many of our assumptions, in particular as to the nature, characteristics and needs of those that technology serves, in such a way as to deliver appropriate, desirable products and services for as broad a range of individuals as is appropriate.

At the same time, we need to understand that ‘technology’ is not something apart from us, but that it, and the way we use it, is a part of our human characteristic and what makes us distinctive as a species. The Greek techne means ‘art’ and is related to tekton, a ‘carpenter’. The Latin equivalent is ars, meaning the ‘ability to turn something to one’s advantage’ (Flusser, 1999). A more contemporary definition would be ‘the systematic application of scientific or other organised knowledge to the practical tasks by ordering systems that improve people and machines’ (Galbraith, 1992). We will come to see that technology can change the very perceptions of our fragile and mortal selves and what we might aspire to – and be capable of – in our quest for completeness.

There is also a need to comprehend the generic types of products and services that we will need, and the best way to envision, realise and deliver these in a relevant and individual-centred way. Opportunities will exist, through new technologies, to enhance work and play, social interaction and independence, in the context of diverse and dynamically changing functionality, needs and desires that will accompany us in our years ahead.

## People

In 1948, the World Health Organisation (WHO) defined health as a state of complete physical, mental and social wellbeing, and not merely the absence of disease and infirmity'. This definition provides an aspiration for designers, manufacturers, technologists and business in providing products and services that have a role in achieving wellbeing amongst humankind. The Department of Trade and Industry's (DTI) Design for Living Taskforce has identified an inter-related set of factors that it believes are fundamental in maintaining and improving the quality of life for an Ageing Population (DTI, 2000). Importantly the DTI goes on to say that 'these factors are not confined to the 'older person', but are intrinsic to designing for all people irrespective of individual characteristics. They provide the cornerstones for designing for inclusion, which foster Active Healthy Ageing'.

We need to be mindful of both the WHO and DTI pursuits of wellbeing and quality of life in our discussion of technology and its applications, and Maslow's hierarchy helps prioritise our needs from survival to self-actualisation, and beyond to spirituality. The choice and application of appropriate technology will entail an understanding of the dynamically changing physical, sensory, cognitive and lifestyle needs and desires of groups and individuals. We require an understanding of how products and services will meet people's clinical and functional needs yet help address people's aesthetic and lifestyle aspirations, and provide better integration with the broader population as well as a greater sense of individual well-being.

## Technology: issues

Technology has always had a role in extending our capabilities in work, leisure, social and recreational events, and in our journey into, through, and from this world. Schumpeter's 'waves' have described periods of technological change transforming the modern world. We are now in an epoch characterised by new media, low-cost computing power, client server architecture, miniaturisation, high volume data storage, expert systems, new sensors, wireless networking, new and smart materials, and responsive robotics to mention a few of the myriad emerging fields and capabilities.

In our discussion, the challenge is not to adopt advanced technologies just in the expectation that they will solve all our

problems – because this is not possible – but to be open to and aware of the implications of these technologies when we consider their application to the difficulties we currently face in delivering inclusive design. It is to seek sustainable technological applications that are person-focused, economically viable, and high quality. It is also how to embody and apply technology in as usable, humanising, and enjoyable a way as possible in our dealings with the world, particularly when that technology has a close, even intimate, relationship with our bodies, our senses, and – increasingly – our minds.

There has been a tendency to link ‘assistive’ technology with ageing and disability. However, it is evident that there is a strong desire in us to increase functionality in every sphere of our lives. There is also a history of products – from early types of digital personal organisers to third-generation mobile phones, which although bristling with ‘features’, did not find ready acceptance in the wider population either due to their functional inoperability, or their social or psychological unacceptability. Programming the ubiquitous VCR, or accessing a desired service through an automated call centre phoneline interface can remain an elusive achievement for many. Conversely, who could have foreseen the scale of popular success of text messaging, originally a software invention to aid those with keyboarding difficulties? However, the ergonomics of mobiles really excludes most sectors of the population from adequately interfacing with these products and the full range of services they offer. How can we ensure that the application of emerging technologies to the goal of inclusive products and services for all does not end up excluding or alienating an even greater proportion of the population, and how can we better anticipate wider social benefits for all from technologies?

The idea of ‘assistive’ technologies that restore or enable a greater degree of functionality across the population is hardly new: spectacles, hearing aids, and dentures are examples of everyday technologies, many of which today have a high degree of functionality and customisation, while at the same time being relatively inexpensive or even disposable. This has been achieved not only through technological innovation, but also through improved design and shifting attitudes to acceptability. We are slowly, as a consumer- and service-orientated society, waking up to and accepting the fact that we aren’t all blessed with, for example,



‘Real time travel’ electronic navigation and ticketing proposal for Omron by Nick Rawcliffe.

perfect eyesight, hearing, agility or memory for the most part (or any) of our lives, although our aspiration is to function as if we do.

The current acceptability of spectacle design has been delivered partially by improved optical technology and manufacturing, and lighter weight materials, but they have also been made more desirable due to improved ergonomics, styling, marketing, and their greater social desirability as a fashion item. Why then do conspicuous assistive hearing devices present such a challenge when a significant portion of the population in our streets builds an aural barrier against the outside world through the technological devices such as MP3 players and hands-free sets dangling from their ears?

### Functionality and multimodality

Will the increasing prevalence of technological ‘appendages’ amongst the greater population ease the acceptability of affixtures that can disguise the additional functionality required by some individuals, or will a conspicuous technological ‘aid’ still continue to stigmatise the individual wearing it? After all, insulin delivery devices now resemble designer pens rather than ‘medical equipment’, and some pain-relief drug delivery systems can be taken for personal stereos. Products such as personal digital assistants, PCs, and services such as cinema, help lines and public transport, are increasingly able to offer multi-modal interfaces and forms of information.

Some recent technological changes have been conspicuous, such as developments in computer, information and communications technologies (C&IT), while others such as medical and bioengineering less so but equally radical and with as great an impact. For instance, intelligent prostheses are now mass customisable, adjustable to the particular needs of the individual through ingenious engineering, more comfortable lightweight materials and programmable miniaturised componentry. This current state of innovation is the consequence of continuous modifications and developments rather than any single spectacular development. These technological innovations demonstrate the convergence of once disparate multi-disciplinary approaches and skills from different branches of science and design. In the case of the intelligent prosthesis, a change in manufacturing culture was also required, away from one of manual skill to one of systems engineering (Armstrong, 2002).

To what extent is technology seen as restoring our view of a complete and ‘normal’ human being? In the area of prosthetics, our notion of ‘disability’ is challenged. One double amputee has two sets of prostheses: her silicon covered (‘Barbie’, as she calls them) artificial legs are used for social and fashion occasions, while she uses her carbon graphite, hypoxy resin ‘C’-shaped ‘Cheetah Foot’ racing legs in competitive 100m sprints (Goldwasser, 1998). The appearance of elite athletes with conspicuous disabilities alongside and ‘even’ competing against able-bodied athletes in the 2002 Manchester Commonwealth Games will undoubtedly have helped change attitudes towards different body forms and their (competitive) potential against our perceived norms. While the spectacle of one swimmer with a missing leg (in her other – terrestrial – environment, she requires an artificial titanium leg) ‘transfixed the crowds and the watching media, (this) appears to have had minimal effect on the athlete herself’ (McQuillan, 2002) and exemplifies a gritty non-defeatist and inspirational attitude, not all of us are so courageous, nor so capable.

Another individual likens his attitude to learning to regain functionality after his spinal cord was severed in a car crash (through ‘a small arsenal’ of customised machines, wheelchairs, grabbers, cordless phones, remote controls etc.) to the strategies employed by toddlers teaching themselves to walk. He goes on to say: “we live at a time when the disabled are on the leading edge of a broader societal trend towards the use of assistive technologies... the disabled have a serious advantage... they’ve been using technology in collaborative, intimate ways for years – to move, to communicate, to interact with the world” although he also adds “making the body work regardless of deficit is not a challenge I would wish on anyone” (Rockenberry, 2001).

When the first cochlear devices were implanted, the boundary between the natural and the artificial, the evolutionary and designed-and-manufactured, became blurred. One scientist’s recent cyborgian forearm implant connecting the neural impulses created by his emotions through his PC to the Internet (Warwick, 2002) more contemporarily examines territory explored by the performance artist Sterlac who bizarrely allowed manipulation of his limbs through muscle stimulation controlled by visitors to his website interface. In a series of animal and human experiments dating back to 1990, a team

We live at a time when the disabled are on the leading edge of a broader societal trend towards the use of assistive technologies...

For those open to the possibility, the definition of human includes a whole range of biological-machine hybrids ...

of neuroscientists and researchers have created a basic but completely functional interface using electrodes surgically implanted into the brain.

These cortical implants comprise small glass cones onto which brain cell tissue is encouraged to grow to produce muscle motion. In an area known as Hybrid Brain Machine Interface (HBMI), one exponent develops the theme of extending functions artificially: “for those open to the possibility, the definition of human includes a whole range of biological-machine hybrids... the ultimate promise of brain-machine technology is to add functionality – enhanced vision, hearing, strength – to people without disabilities” (Rockenberry, 2001).

Technological innovation can raise profound ethical issues, such as those of regenerative medicine which has moved in a short space of three years from apparently far-fetched theory to scientific fact with human trials replacing those on animals. These technologies, which have particular relevance to the issues of ageing and disability, have the potential to prolong life span, recreate diseased or damaged organs and other body parts including joints and brain cells. This will be achieved through stem-cell technology that may be able to restore function over a broad region of the nervous system. Pharmaceutical companies see this as a medical holy grail and are currently pouring billions of pounds into research in this area.

The systematic application of the technologies that medical scientists now and will soon have access to over the next 20 years has the potential to give an increase in estimated lifespan of another 20 or 30 years, “so that most people can expect to live a healthy life of 110 to 115 years” (Haseltine, 2002). If one adds to this anti-ageing therapy, and anti-cancer drugs, then that lifespan may be even more prolonged. However, there is a consequence to all this. Regenerative medical biotechnologies raise the complex issues of increasing life expectancy, normal working life, and opening up fissures between those parts of the globe who can and those who cannot access these. As a cautionary note one commentator asks “Will our beleaguered pensions see us through 50 or 60 years of retirement? Will people of developing countries be offered the same treatments, and if not, how will they react? This is all great for us individuals, but how good will it be for society? Can we use this technology to the benefit of mankind as a whole?” (Haseltine, 2002).

## Technology: emerging fields and opportunities

The ethical dimensions of recent technologies may well leave us feeling overwhelmed, but having outlined the very human contexts of wellbeing and inclusiveness and sketched some of the many complex issues raised by technologies, it would be useful to discuss, in more detail, some of the emerging technological fields and opportunities that may help us deliver more inclusive products and services.

### Materials engineering technology (MET)

Materials go through four main stages of evolution: development, expansion, consolidation and decline. Ashby shows that, after a recent period of dominance in metals technologies, polymers, composites and certain types of ceramics now show great promise (Beukers and van Hinte, 2001). This is due to their low density, i.e. lightness, one of the qualities that will characterise developments in materials along with smartness or intelligence, portability, strength and hardness, transparency, and environmental sensitivity. Lightness as a quality will have great impact on, e.g. the construction industry. For example, aerogel – made from a maze of silica strands only 1/1000th the thickness of human hair and with 95-99% empty space, is only three times the weight of air, yet a one pound block can support half a ton.

In the area of new materials, adaptive materials, developed for next generation aerial vehicles, will be capable of changing their shape (i.e. rheology) when applied with heat, electrical signals (and electro-rheological) or magnetic (magnetorheological) fluids. They would be able to repair themselves and adapt in shape, to operate in the same way that muscles act in birds and insects. Able to change 'from the flexibility of a rubber band to the stiffness of steel in under a 100th of a second, they may be combined with stress-sensitive material to prevent sports injuries, from sprained fingers to broken necks' (McKie 2000). The next generation of smart prosthetic limbs will also be able to incorporate embedded sensors.

Developments in 'fluidic muscle' which use membranes of high-tensile-strength fibres woven in precise computer-calculated patterns will allow a new generation of actuators with industrial strength and speed, to replace conventional pneumatics (Dickey, 2001). These have applications in robotics, micro-robotics and also in limb replacement. The next generation of smart prosthetic limbs will also be able to



Leg exerciser, RSA Student Design Awards entry by Tim Parsons.



### 11.1 Impact Wave

An integrated system of flexible body armour combining wearability with hip joint protection.

incorporate embedded sensors. One example of design leading the application of materials technology is the Impact Wave clothing (Figure 11.1) that 'cares and protects' – an integrated system of flexible body armour combining wearability with hip joint protection.

It comprises two materials combined in multi-layers which stiffen upon impact to provide protection, but flex with the musculature of the body when protection is not required, thus combining safety with comfort. It claims it is 'up to 10 times more effective on pressure distribution and three times more effective on force than conventional foam and plastics systems with the added benefit of flexibility.' This has a particular application in the protection of e.g. hip joints in osteoporosis sufferers.

According to Els Zijlstra of Materia, materials are being developed for both their technical and aesthetic qualities, 'to satisfy constructional, physical and sensory requirements' and 'to meet social demands such as safety and environmental friendliness' (Zijlstra, 2002). She goes on to say 'multisensory properties (of new materials) seem to hold a special attraction for designers. The experiencing of a design is after all determined by the shape, odour, colour, warmth or coldness, tactility, texture, sound, luminosity and contrast of the materials used in making it.' Santoprene®, a type of neoprene rubber used in GoodGrips® products, demonstrates the application of good design and materials technology to designing for ageing and resulted in a product range with transgenerational value.

The issue of how cultural values are addressed through aesthetic innovation in materials is an area that also interests Philips Design in Holland, and what Stefano Marzano refers to as the creation of 'ambient intelligence', a 'personalisation of objects through the embodiment of intelligence which will allow products to react, be educated, and respond' (Marzano, 2002). Philips and other companies have been developing technical innovations in garments and textiles, through wearable electronics with embroidered or printed switches, flexible displays, and vibrating textiles. One Brussels-based company is developing a 'smart' track-suit for athletes which monitors blood pressure, heart rate and body temperature. The German Textile Research Centre is exploring the incorporation of types of molecules that can either 'eat' odour to provide a garment with built-in freshness, or apply medical substances such as ointments evenly.

## Processing power

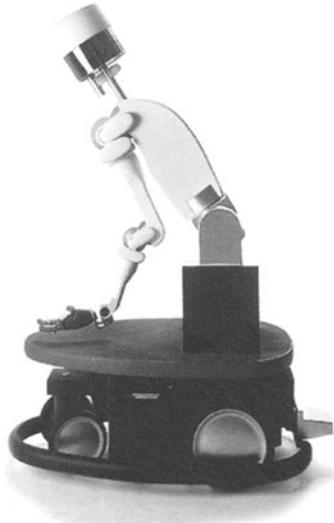
According to Moore's Law, every two years you get twice as much circuitry running at twice the speed for the same price, an effective quadrupling of the value of processing power. We can predict that this will continue to be the case, for the short-term at least, until quantum computers can be developed beyond the theoretical stage. The original Intel 4004 microprocessor launched in 1971 contained 2300 resistors. The Pentium II processor includes 7.5 million. Projecting over the next twenty years, one can foresee the ubiquitousness of computational and electronic assistive technologies through this increasing power of – and dramatic drop in the cost of – computation.

Although the future has a habit of catching up with us faster than we expect, Kurzweil provides his own decade-by-decade forecasts of the projected capabilities of machines arising from this type of technological development (Kurzweil, 1999). For example, he predicts that by the year 2019 a \$1000 computer device (in 1999 dollars) will have the computational ability of the human brain. He also predicts that by this time, "blind people will routinely use eye-glass-mounted reading-navigation systems, deaf people read what other people are saying through their lens displays, and paraplegic, and some quadriplegic, people, will routinely walk and climb stairs through a combination of computer-controlled nerve stimulation and exoskeleton robotic devices." Developments in computer and information technology (C&IT) will allow greater adaptability and customisation through their application in a wide range of products and services. There is a need to specify the most appropriate method of interacting with technology, through adaptable and customisable interfaces, to suit individual need and preference: 'smart' products that will adapt to people's changing dynamic needs. The DTI forecasts there will be a need for simple robust interfaces and services between the user and the technology that are individual, personalised and adaptable. This is already seen, to some extent, in products such as automated telling machines (ATMs), mobile phones and personal digital assistants.

**Some quadriplegic people,  
will routinely walk and climb  
stairs**

## Communications

Communications technology, including wireless and radio applications will free up devices from servers and processors and allow greater flexibility and freedom around and outside the office and home. The



'Movaid' Domus Academy, Milan.

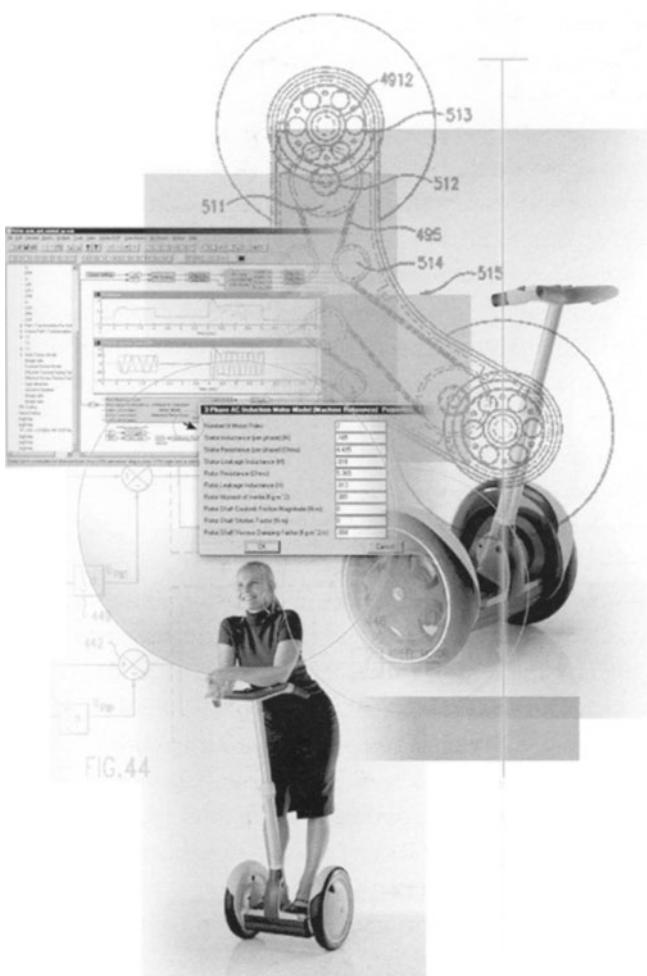
BT In Touch 2000 phone is a very simple device, a pendant that acts as a panic button: in an emergency it triggers a call to up to three predesignated numbers.

There are also wireless communications devices that can keep track of individuals, e.g. a watch worn by an elderly woman who has a heart problem who might become unconscious. The communications technology field has a good track record in dealing with complicated brain-machine interfaces for the sensory- and voice-impaired and is also the area in which the trade-offs between functionality and ease of use are most critical. Computers that turn text into voice have a much easier technical specification currently than a device that converses with the ease and speed of normal speech.

## Robotics

At this present time, there are approximately one million robots worldwide, mostly in industry, with more than half in Japan, developed with the support of the large motor manufacturers. Just as games consoles provided the Trojan Horse for introducing computers into the home environment, cyberpets are making robots acceptable in the domestic arena. What began with the Tamagotchi (essentially a key fob which beeped and chimed when it wanted attention) has developed into the small silver-coloured and 'endearing' Sony robotic pet dog AIBO (meaning 'companion' translated from the Japanese), found in the homes of 45,000 owners worldwide. It is an autonomous robot which learns, acts 'on its own' in response to external stimuli, and is able to display a number of emotions – happiness, sadness, anger, surprise, fear and dislike. Not only does this represent a superb accomplishment technically, but also, in terms of affective human factors design, the understanding of and translation through technical achievements of the ability to generate emotions (Grinyer, 2001; Menzel and D'Aluisio, 2000).

The ASIMO robot developed by Honda has predictive walking which allows it to anticipate each step, and can also recognise fifty voice commands and their direction source. The Ibot wheelchair provides a transportation device that has the functionality to climb stairs, walk, and stand upright with all-terrain motion. It uses an onboard computer and a system of miniaturised aviation-grade gyros to assess the centre of gravity and deliver a signal to high-speed motors which turn the



### 11.2 VisSim™

Software for modelling and simulation of complex movements of the human body was used to design the Segway™ Human Transporter. © Visual Solutions Inc and Adept Scientific plc. Virtual Technologies

wheels accordingly to prevent the user from falling over. Some robotic systems are less conspicuous and recognisable, but nonetheless part of our lives, such as driverless light rail systems, and it is conceived that robot cars will soon benefit from advances in satellite navigation systems – the French CyCab by Robosoft is one example. VisSim™ software was used to design the Segway™ Human Transporter (Figure 11.2). This vehicle, which utilises dynamic stabilisation technology via gyroscopes and tilt sensors, software and electric motors to produce a balanced ride, is similar to the way in which the human body generates data from the inner ear and processes it in the brain to stop people

falling over. The VisSim™ software provides a powerful simulation tool of how the body moves. The potential for application to inclusivity is great.

Virtual technologies have an important role in providing virtual environments for training, cognitive rehabilitation and those with special needs, for those with learning disabilities, or for those who have suffered strokes or other forms of brain injury. They offer multi-channel communication, the possibility to explore the development of e.g. walking aids based on wearable/ubiquitous computing, intelligent transport systems for pedestrians, robotic travel aids for visually impaired, and acoustic virtual environments to explore speech and communication design. We should also acknowledge the role of virtual technologies in virtual and rapid prototyping, used in the product development process.

### Other emerging trends and fields

Other areas to watch in terms of emergent MSE fields are microgravity, nano-, and bio-mimetic materials, and the trend towards miniaturisation. In the early sixties, pacemakers were the size of bars of soap, but now they are small enough to be barely detectable under the skin, and hearing aids can now be hidden completely in the ear canal. Nanobots are fusing developments in robotics and nanotechnology. There is a host of other technology fields, including biosensors, artificial intelligence, machine vision systems, neural networks, and speech recognition that will help develop more inclusive products.

With greater ubiquity, individual customisation and adaptability, technical performance, and emotional intelligence (the latter through the application of effective human factors design, that is, the design of human responsiveness and emotion), the application of these technologies has the potential to produce more humane products and services. They will allow the needs of the ageing and the disabled to be subsumed within a much greater spectrum of products which are designed for us, recognise us and behave more responsively to us as individuals, which are useful and attractive and which are appropriate to individual lifestyles across the age and ability ranges.

## Health care

If we now return to the WHO and DTI Design for Living Taskforce aspirations mentioned earlier, we can see that the above technologies have much to offer in the area of inclusive design, particularly in the area of health care. Health has a crucial bearing on our functional and emotional state, and this area is now discussed in some more detail.

### Preventative and diagnostic technologies

Increasingly, advanced technology can be used in the proximity of the body through well-designed consumer-orientated medical products. Devices can now sense, scan, probe, measure, record, and evaluate health and physical functions. Some are as easy to use, as cheap as, and resemble wristwatches. They can liberate an individual from the traditional requirement to endure repeat visits to a doctor or hospital to monitor e.g. ambulatory blood pressure or electrical heart impulses (Thackara, 1997).

More in the domain of the medical professional is equipment designed to detect damage, disease and deterioration. For example, physiological systems engineering includes software products for 3D imaging and visualisation of medical scanner data (e.g. ultrasound MRI and CT scans) to make the most sophisticated visualisation features, normally the preserve of departmental workstations, accessible to individual clinicians on their desktops. Advances in magnetoencephalography (MEG) help determine the localisation of brain activity, but the design of the equipment must consider two areas of human need: firstly, easy to operate by the professionals and secondly, be acceptable and non-threatening to the patient.

### Interventionist technologies

These, discussed in the previous section, and concerned with regenerative medicine and biotechnologies, intervene with the ageing process, or assist the body's processes of repair to damage brought about by age, disease or injury.

### Reparative and restorative technologies

Used to repair and restore the body to an improved state and require the design of medical and surgical tools such as endoscopes, the design of these has benefited from powerful lighting and multivideo



### 11.3 Blatchford Elite foot

Designed for an ultra-marathon runner combining the efficiency of carbon fibre springs with an integral titanium and aluminium shock absorber.

cameras, and a range of additional probes and tools. As these minimally invasive tools have high functionality, usability design and ergonomic considerations are vital. For instance a lightweight and well-balanced construction results in more precision and less fatigue. The training of surgeons has also improved thanks to developments in virtual reality simulators and haptic devices.

Nanotechnology offers other possibilities, e.g. scientists have collaborated in the design and construction of an aspirin-sized robot fitted with miniaturised electronic scanners. The idea is that when swallowed, these pill-proportioned probes would migrate to a patient's stomach and intestines and transmit crucial medical data. Details of acidity, temperature and pressure, and the presence of chemicals giving rapid warning if s/he has a leaking ulcer or a broken blood vessel caused by a tumour, could be transmitted. One ambition is for probes cheap enough so that they can be sent to patients so they can swallow them at home, and relay their medical data via phone lines (McKie, 2000).

## Replacement or enhancement technologies

This category embraces areas of bioengineering covering the spectrum of prosthetics and orthotics, as well as devices such as hearing aids, spectacles, dentures, to make up for reduced functionality or to enhance existing physical or sensory functions. The intelligent prosthesis has already been mentioned and the Blatchford approach allows mass-customisation due to the nature of its design (Figure 11.3). Prosthetics for amputees and paraplegics will in future benefit from a number of developments in brain-machine and brain-computer interfaces, and actuator, materials, sensory feedback and robotics technologies.

Another growing area in this category is that of the development of new bionic senses. Geary describes the development of many electro-mechanical devices to improve, enhance or repair the senses and explores the convergence between biology and technology in each of the five senses and the mind (Geary, 2002).

## Rehabilitation technologies

These help restore the body to its previous level of functionality. One growing area is for devices that help both physiotherapists and stroke victims themselves to retrain the body and mind to recover or compensate for lost power and control. Other developments aim to

restore lost function to paralysed individuals by, e.g. using feedback control of electrical stimulation systems. Associated also with this area is rehabilitation robotics. Finally in this area cognitive prostheses are being developed through virtual technologies.

In summary, user-friendly technology will have an increasing role in fostering greater co-operation and collaboration between the health care professions and individuals in caring for our future selves and maintaining our optimum capabilities.

## **Design: bridging technology and people Generic products and services**

We have a view of what is emerging technologically and now need to ask how this could be applied to promote inclusive design: what generic products and services will we need and want? One useful framework for defining generic products and services is provided by the DTI's Design for Living Taskforce mentioned at the start of this chapter. The DTI has identified an inter-related set of factors that it believes are fundamental in maintaining and improving the quality of life for an ageing population. These are design for: stimulation, both physical and cognitive; flexibility, to accommodate changes brought about by the ageing process; independence, through choice and control; and social interaction, through family, friends, neighbours, and the wider communities. These four areas are broad and easy to integrate into the design specification. To provide more detail, the DTI document discusses a number of scenarios for 'desirable' products and services including: housing and household technology; the SMARTer House with modular bathrooms and kitchens designed with the needs of the ageing population in mind; homes that are more flexible, safe, secure, convenient, and appeal up and down the age range; real and virtual communities; leisure and tourism; transport; communication and information technologies; changing work patterns; and healthcare.

Newell usefully provides a range of different design situations to be considered when designing for what he terms the 'dynamic diversity' of the population. He identifies these as follows:

- Universal design – equipment designed for as wide a range of functionality as possible, e.g. an autoteller.
- Optional accessibility features within general purpose (usually software) systems which can be called into place as required.

- The inclusion of ‘hooks’ or special input/output devices within software and systems into which specialised accessibility software and hardware can be connected.
- Input and output modality translation systems, such as speech-to-text systems, for when such hooks are not available.
- Plug in accessibility systems: e.g. speech output and Braille displays
- Stand-alone assistive technology that provides particular support for a disability rather than access to standard systems (Newell, 2002).

**Targeting the ‘THEM’ (people who have Time, Health and Enough Money) generation solely on the basis of age is seen as ‘patronising’: ‘this isn’t about age, its about attitude and lifestyle**

### Design-led approach

Designers are good at developing scenarios for living and synthesising social and technological trends into people-centred products, that is, to provide products and services which give value and meaning to people’s lives. Some generic tools have been developed to enable the designer to specify technology appropriately through a better understanding of its beneficiaries, in terms of:

- the characteristics of individuals and populations,
- their lifestyle needs
- desirable qualities in products and services.

Physiological changes accompanying ageing are described in Pirkle’s demographic charts (Pirkle, 1994) that show the change in acuity of each of the senses as one ages decade by decade and also provide designers with design strategies and design guidelines. As outlined above, Newell’s proposal for design for dynamic diversity describes the increasing diversity and multiple reductions of functionality and change in performance found in populations as they age.

Every individual loses functionality at a different rate. Keates and Clarkson’s ‘Design Cube’ (Clarkson et al., 2000) (Keates et al., 2002) models sensory, cognitive and mobility capabilities in individuals and populations and in turn can be used to specify sensory, cognitive and mobility characteristics in products. Porter’s ‘multivariate accommodation’ (Porter, 2001) (when the product being designed requires reconciliation on a large number of dimensions) provides a model for ergonomists that will help supply ergonomic data that is more individual-centred as distinct from broader ‘population’-centred approaches. The designer also uses tools that help imagine and define how we might want to live, work and play such as scenario-building,

or design-by-storytelling, one of many user research methods found in the Methods Lab (Aldersey-Williams et al., 1999).

Despite the issue of reduced functionality, we should not discount that our life experiences will have shaped many valuable capabilities, and many individual needs and desires. Good research informs preconceptions, subverts stereotypes and provides insights into socio-economic groups, developing markets and possible future business opportunities. For example, targeting the 'THEM' (people who have Time, Health and Enough Money) generation solely on the basis of age is seen as 'patronising': 'this isn't about age, its about attitude and lifestyle. (Ward, 2002)

## What technology needs to deliver

Although courageous attitudes and achievements can be cited, every individual copes with, adjusts to, or expresses their attitude and ability to cope with the reduction or loss of functionality due to ageing, accident or disability in a different way. Or we may just want to do something easier or better. In applying technologies to enhance or assist, these will require to display a number of characteristics in addition to quality, performance and reliability:

- dynamic adaptability and customisation
- cultural sensitivity
- aesthetic appropriateness.



Driver interface proposal, Renfrew Group

## Dynamic adaptability and mass-customisation:

Every individual's body, senses, mind and lifestyle is different and these all change over time. Any technological device should be able to accommodate and respond to these changes. Examples of industries already rethinking their approach to their customers' needs include FIAT – discussed in detail elsewhere in this volume – who can begin to customise the type of control interface to suit their particular characteristics on the company's web page. Similarly, Renfrew has developed a concept for a personalised control for a car that can be programmed to the individual needs of the user via a smart card. Renfrew's design principle was seen as something that could become as commonplace as optional customised sunroofs and wheeltrim features on today's standard mass-produced car.



'New Media for Older People' scenarios  
by Domus Academy, Milan.

## Cultural sensitivity

Sensitive issues can arise through the introduction of new technology. There is a need to understand the social acceptability of products and systems including stigma, barriers to adoption, rates and ease of uptake, and how to overcome the social isolation of those unfamiliar or afraid of technologies such as the digital domain. As there are sometimes deep cultural factors that can confound designers of technology: they need to think in the broadest possible terms when tackling technology at the human-interface.

For example, one of the first machine-to-brain devices, the cochlear implant, was heralded as a miracle cure for some forms of deafness when it was fully introduced in the 1990s. Although the initial response has since been modified, many deaf people at the time viewed the implant as a form of 'ethnic cleansing and physical mutilation'. The implant, according to its opponents, 'was a direct confrontation to the shared experience of deafness, the language of signing, and all of the improvisations deaf people have developed over many generations to function without hearing.' Whatever technology was used, the individual still had a hearing loss, and if the battery failed, panic may have ensued.

How do we develop better ways for designers to understand what it is like to be old or disabled? Trends in technological uptake can also vary with age group and there is also a real issue of people's finite limits to 'gadget tolerance'. This clearly points towards the need for co-design, designing with those for whom the very designs are intended.

## Aesthetic appropriateness

We have seen, in the section on materials, the growing concern for aesthetic as well as technical qualities in materials. Effective human factors design is concerned with the shift from looking merely at users, products and tasks, to looking, more holistically, at people, products, and relationships, and in the process extending the range of considerations from performance and pain to include pleasure, an important part of our concept of well-being. This significant field, which developers of technologies are beginning to become alert to, will be important to extend the range of considerations of what constitutes

'pleasure' and 'emotional' content in products and services (Green and Jordan, 2002).

## Conclusion

There is a greater need than ever for different disciplines to work together to develop both a broader and a deeper understanding. Excellent examples of this can be found in the design-led Helen Hamlyn Research Associates (HHRA) programme based on partnerships between business/industry and its research centre, and also its Design Business Association (DBA) Design Challenge which demonstrates the business potential of taking an inclusive design approach to product and service development in the care and disability sectors.

Also noteworthy is the development of the field of gerontechnology. While 'gerontology' is the science of ageing, 'gerontechnology' is defined as 'an age inclusive society supported by technology'. Gerontechnology helps provide a clearer understanding of some of the issues involved, and already there are some excellent exemplars such as the Arcada University in Helsinki which offers a degree in human ageing and gerontechnology, and the Ingénierie du Vieillissement, Université de Paris, which offers a postgraduate degree in Ageing Engineering. The aim of this latter degree is 'to change the passive medicalised and socialised approach to a positive and preventative approach.'

To conclude, in the future we will have a population with a much broader sensory, cognitive and mobility/physical ability profile than that of today, with different lifestyle patterns for work, leisure, living and social interaction, and with diverse socially- and culturally-induced needs and desires. The extent to which technology will mediate for our greater individual wellbeing through products and services that satisfy our physical and emotional needs across the age range is the real issue at the centre of this discussion. Technology, like scientific knowledge, is of itself ethically neutral, and can become either a negative or positive force for inclusivity depending on how it is handled. This makes the future dependent on choices made by business, and also on the inventiveness of designers who can deploy technology to shape a future which is more or less inclusive, giving an ethical dimension to the way we humanise technology and also a space in which we can make choices and exploit the opportunities presented by rapid technological change.



'New Media for Older People' scenarios  
by Domus Academy, Milan.

## Acknowledgements

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Other images: Tim Parsons, RSA New Design for Old winner 1996; Dan Plant, RCA Industrial Design Engineering graduate and Helen Hamlyn Research Associate 2000 partnered with Levi Strauss Europe, Middle East and Africa; also the Renfrew Group, DBA Challenge finalist 2000. Thanks to Professor John Drane, Prue Bramwell-Davis and Malcolm Withnall of the Department of Industrial Design Engineering at the RCA,

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## **Best practice**

This section identifies examples of best practice in inclusive design across a range of business and industrial sectors.

Martin Bontoft and Graham Pullin of international consultants IDEO set the scene with an overview of how inclusive design can be explicit or negotiable within design briefs, or a trigger for strategy, using such products as medical equipment and mobile phones as case studies to demonstrate different ways forward.

Alessandro Coda and Richard Gadeselli describe how a major vehicle manufacturer is making its products more accessible for older and disabled people in the award-winning Fiat Autonomy Programme. Jeff Patmore and Lisa Mahoney of BT address Internet usability via a toolkit of methodologies. Their message: users first, technology second.

Nina Warburton of Alloy presents a product designer's perspective on achieving best practice while, in the final chapter of this section, Raymond Turner of BAA (British Airport Authority) describes how inclusive design principles influenced the planning and design of the new Terminal 5 development at Heathrow Airport.

## Chapter 12

# Connecting business, inclusion and design

Graham Pullin and Martin Bontoft  
IDEO London



As consultants to a diversity of businesses, our experience is that it is rare that inclusive design is on the agenda from the outset. Inclusion may be part of the design brief, but more often its importance needs to be negotiated during a project – although increasingly inclusion can be introduced into earlier, more strategic discussions. This paper considers each of these three cases and shows that the ways a connection can be made between business and inclusion can be different in each.

## The role of the brief

IDEO is a consultancy with user-centred and innovative design at its heart. Our business is designing products, environments and services, or otherwise bringing our design processes and sensibilities to bear, in order to build our clients' businesses.

The brief is an important point of contact between our clients' business needs and our own. For our clients it can define how our contribution will benefit them, against which to weigh their investment in this collaboration. For us, it defines a role that we are confident we can meet, that will deliver real business value and so build a longer relationship.

It is rare that inclusive design is explicitly on the brief from the outset of a project. This short paper considers three different situations:

- when inclusive design is on the brief from the outset (when inclusion is an agenda)
- when inclusive design is not explicitly on the brief (when inclusion is negotiable)
- when inclusion is discussed before the brief (when inclusive design could be a strategy).

The connection between business and inclusion, and ultimately the justification of inclusion in business terms, can be different in each. Therefore, so is the way we are able to reflect back the value of inclusion to our clients.

## When inclusive design is in the brief from the outset

The most straightforward case, but also the most uncommon, is when inclusion is an agenda. This tends to happen when the focus of our client's business is already on a particular sector of the population which (for whatever reason) is more affected by disabilities than most, for example due to the effects of diabetes in the case of insulin injector

### How best can this project deliver the inclusion that is our goal?

pens, or when the project is affected by legislation related to disability, for example meeting mandatory levels of accessibility in the case of architectural environments.

The optimistic outlook is that both of these agendas are on the increase: businesses are recognising the value of addressing the needs of an older consumer base, and with this the multiple impairments often associated with ageing. Accessibility legislation is becoming more widespread, with more comprehensive standards for the built environment becoming mandatory in the next few years, and the Disability Discrimination Act extending accessibility to facilities and services.

We find that some of the most interesting design opportunities occur when product, services and environments overlap. Inclusion too inherently involves all three. Telecommunications is a good example of social interaction (or exclusion) mediated by services, enabled by products in the context of public and private spaces. Each needs to be considered in the light of the other, and the boundaries start to blur altogether in the case of products connected to the internet or telephone network, ‘automated’ services and intelligent and interactive environments.

When inclusion is firmly on the agenda, any discussion is then largely tactical – how best can this project deliver the inclusion that is our goal? This can still be challenging, however. Inclusion is about culture and cognition, not just mobility and dexterity. It may be that wheelchair access, that icon of accessibility, is improving, but there are many other causes of exclusion that are less ‘visible’ and less easily understood. Exclusion caused by cognitive and learning impairment may be the most challenging for designers to address. Often this overlaps with cultural issues, whether ethnic, educational or age-related. Ability and disability is multifaceted and complex, and requires that inclusion to a certain extent be defined afresh within a particular business.

As will be discussed in the second half of this book, inclusion cannot be delivered from a textbook or a spreadsheet. It demands that users be involved in some way with any design process. This takes time and requires an investment in this activity, and this is where matters cease to be straightforward on any commercial project. Experience bears out that a balance has to be struck on any project between time (research time; development time; time to market), cost (consultancy

fees, production costs, selling price) and quality (including depth or breadth of user involvement, degree of iterative refinement, range of features). There is nothing exceptional about this. Commercial and competitive pressures always constrain time and investment costs, which need to be outweighed by potential return on this investment. Quality may seem sacrosanct, but needs to be defined in order to be defended against the other two less subjective measures.

'Inclusion' is interesting in that it plays out within each of these areas. Most simply, inclusion can be seen as one aspect of quality. The methods that can increase it demand skill and experience, but will always also demand time and money, so inclusion will to some extent need to be balanced against resources. Reflecting inclusion back to a client as an issue of quality can be compelling, as all companies like to see quality as a core part of their brand, and quality is also fundamental to market differentiation and competition.

However with accessibility legislation growing, time can be an important dimension too. An inclusive design constitutes progress towards meeting future legislation and may preclude a time-consuming change of direction at a later date. Financially, if inclusion increases market size it can increase return on investment, against which the activities to achieve it can be justified.

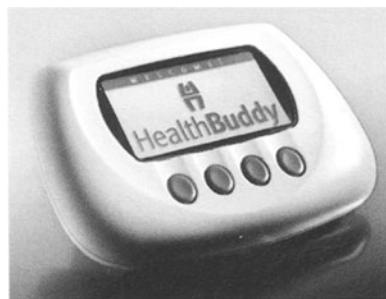
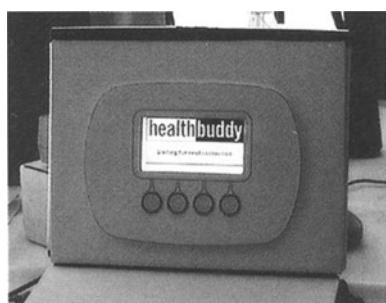
### Case study 1: Health Buddy

Health Hero Network provides technology solutions for health monitoring allowing people to better understand, manage, and communicate with their care providers about their health conditions from the comfort of their own homes. At the centre of the system is the Health Buddy, a small tabletop device that asks the patient a series of questions at periodic intervals about such topics as how they feel, their eating habits, their symptoms, and their medication compliance. The answers are sent to a service centre and assessed by a nurse or physician over the Internet.

Many Health Buddy patients are elderly people who have never used a computer. The human factors and interaction design team used early prototypes with users to develop an accessible interface that did not rely on a user's knowledge of the language and conventions of computer interactions.



Early testing of Health Buddy device and interaction with users.



Health Buddy: prototype and production model.

Far from needing to be convinced, our client Health Hero Network encouraged this degree of user testing. As a result, the product has delivered real business value to them on the basis that use of Health Buddy has been shown to reduce emergency room visits and hospital days, with corresponding savings on healthcare costs.

Internally, the careful documentation of the user testing has given continued authority to the early design decisions. As the company has grown from a visionary start-up to an established implementer, this evidence has maintained advocacy for the design principles throughout the workforce and preserved the integrity of the original project vision.

In 2000, the Health Buddy was awarded the silver Medical Device Excellence Award and was selected as one of the Best Products of 2000 by Business Week. Health Hero was selected in 2001 by major industry associations as the Best Telehealth Vendor and as Best Enabling Technology.

### When inclusive design is not explicitly in the brief

Design always involves balancing a number of mutually affecting, and at times antagonistic, criteria. When inclusion is introduced into a project, it must take its place amongst other criteria. This is not to say that it needs to be compromised – by placing a high value on any single criterion, it can hold its own, but that this may be at the expense of other, also desirable, criteria – but it does become negotiable.

Inclusion needs to be able to be introduced into this ecology and survive, indeed thrive, as good design is borne out of these conditions.

This, we believe, is contentious to many people in the field of inclusion. Some believe inclusion should not be subjected to these forces; others that inclusion can be immune to them.

The assertion ‘A more inclusive design needn’t be less affordable (or less attractive or less portable, etc.) than an excluding one’ is true, but is misleading if interpreted as ‘a more inclusive design need never be less affordable (or less anything else) than an excluding one’. Whilst there are instances where this is the case, and we should strive to discover these opportunities, it denies the compromises which may have to be made. If we value a criteria – be it portability, sensuality, reliability or inclusion, we are prepared to give it a higher priority than others. When push comes to shove, we are prepared to make a choice in its favour.

We see these issues of priority being played out in many industries. In transportation safety is now accepted as a priority for which other compromises will be made (albeit to a greater or lesser extent in different areas). One way of unlocking this trade-off is to focus on the results and benefits of inclusion, not the issue alone. Whilst inclusion has a complex relationship with almost any criterion, it has a resonance with particular themes of ease of use and effortlessness, longevity (of a product and of its ownership) and suitability for communal or public use. What is needed is to establish a vision which inclusion can support. This will give inclusion authority and ensure resonance and consistency with other criteria being balanced to achieve the same end.

### **Case study 2: the Spyfish STV**

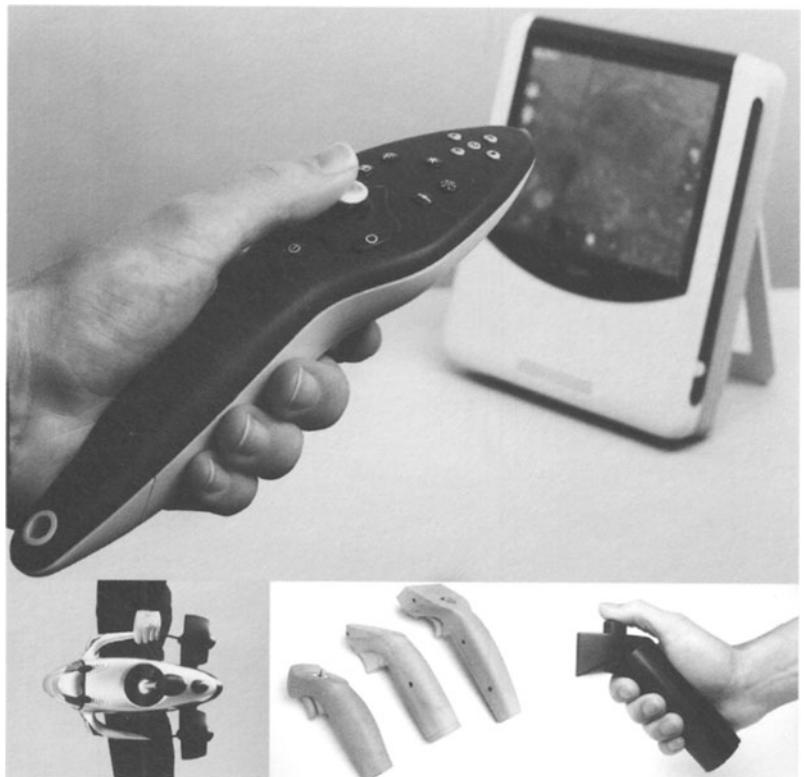
The Spyfish STV (Submarine Telepresence Vehicle) is a remote-controlled miniature submarine equipped with video cameras and lights and connected to the surface by a cable. Up on their boat, a group of users control the Spyfish STV and watch live video with overlaid graphics. It reinvents the marine researcher's remotely operated vehicle (ROV) as a leisure product and creates a new underwater experience.

The Spyfish STV is the result of ten years' research and development by H2Eye, who turned to IDEO to define the user experience. The hand controller is just one element of the system and is the means by which the user pilots the vehicle. The brief called for a single-handed controller so that the user would always have a hand free to steady themselves on a gently moving boat, or even to move around up on deck. This is a demanding brief in itself, given that the vehicle is a complex system of motors, cameras and lights.

We chose to go further still and design a hand controller with a symmetrical design allowing left and right-handed use and with a handle that accommodates different postures and so different hand sizes. Both these criteria represented a compromise on the optimisation of ergonomics for an 'average' right-handed able-bodied male adult and we did have to ensure that the design would still appeal to this group.

The authority of this approach to inclusion resided in two aspects of the vision for the product:

- to lose yourself underwater (to lose yourself as in to forget yourself; to immerse yourself)



The Spyfish STV hand control and on-screen interaction, and (inset) the Spyfish STV, plus samples of ergonomic rigs for early testing with users.

- to use the Spyfish STV together, across a multigenerational family group.

The role inclusion had in achieving these core goals gave it the credibility it needed and therefore justified the resources to carry out ergonomic tests with people with small and large hands and user tests with a diversity of people.

To be immersive, the interaction needed to be intuitive and so easily accessible to people with limited or no experience of the technologies employed. To be multigenerational, the products needed to accommodate a wide diversity of people.

It seems appropriate that this degree of inclusion has been achieved in a product that can also be seen as an alternative to SCUBA diving, itself a demanding and in many ways excluding activity.

## When inclusion is discussed before the brief

As design consultants to a diversity of businesses, from multinationals to start-ups, from product manufacturers to service providers, (for whatever reason) it is rare that IDEO is explicitly required to address inclusion. However we increasingly find ourselves in a privileged position of conceiving a strategy with our clients and so have an opportunity to introduce this agenda and influence priorities. Both we and our clients see it as our responsibility to challenge assumptions, and in this case inclusion can become part of the strategic mix.

Accessibility legislation is progressing from the built environment to services and products. At the heart of most legislation is the concept of 'best practice', of precedents defining and advancing standards of acceptable accessibility. As soon as their competitors address inclusion, any company will increasingly come under pressure to do the same.

Innovation is increasingly seen as a means to gain competitive advantage by not just reacting to standards set by competitors, but taking the initiative. Inclusion is an issue that could disrupt many industries, could change the rules of competition. A company can adopt someone else's best practice, or decide to define and own best practice themselves.

Companies aspire to form long-term relationships with their customers based on shared values. A broad issue of 'diversity' of culture, age and lifestyle is increasingly core to a company's brand. We sense that inclusion is considered too marginal by some companies, but in many ways disability is (only) another aspect of diversity.

**Inclusion needs to be strongly represented during the prioritisation of time, money and quality**

## Case study 3: mobile products

Mobile products in particular can challenge our definitions of inclusion. When designing for a user, it is not their maximum capabilities that should be relied on, but their abilities in the context of use. For example, a tourist may be carrying luggage (acquire a dexterity impairment) and not read or speak the native language (acquire a communication impairment). These considerations appropriately blur distinctions between 'able-bodied' and 'disabled' users and demand that an understanding be developed afresh in context.

IDEO recently began conceiving a mobile product with a client. Although intended for a mass market of sighted users, the strategy was to design a non-visual interface aimed at temporary, contextual user

**When inclusion is discussed before the brief ... inclusive design can be seen as a business opportunity for competitive advantage**

needs where 'eyes-free' operation is beneficial or necessary, for example whilst negotiating a busy pavement or whilst monitoring another task.

Nonetheless we invited two blind people onto the design team for reasons we hoped would prove mutually beneficial: blind and partially sighted people are expert users of non-visual interfaces because they rely on them. The depth of their experience is therefore unique and we believed that involving blind users would help us design a better interaction for sighted users.

Our client was not only supportive of this investment, but recognised that if their product were accessible to blind and partially-sighted people then this in itself would represent a sizeable and underserved market. More inclusive design is better business.

### **Ways of connecting inclusive design to business**

We have considered cases in which the connection between business and inclusive design is addressed at different stages. The way in which inclusion plays out in a business discussion can be different in each case:

- When inclusive design is on the brief from the outset (when inclusion is an agenda), inclusion needs to be strongly represented during the prioritisation of time, money and quality, balancing the resources necessary to achieve inclusion against the effect inclusion can have on meeting the brief.
- When inclusive design is not explicitly on the brief (when inclusion is negotiable) it is beneficial not to treat inclusion as a separate issue, but to embed it in the core project vision. This makes it less vulnerable and establishes robust relationships between it and other valued criteria.
- When inclusion is discussed before the brief (when inclusive design could be a strategy) inclusive design can be seen as a business opportunity for competitive advantage ... even a disruptive influence which can challenge the rules of competition.

## Chapter 13

# The Fiat Autonomy Programme

**Alessandro Coda and Richard Gadeselli**  
Fiat Group



## **Background**

Alessandro Coda, has led the Fiat Autonomy Programme for the past seven years. Through this programme, a major vehicle manufacturer has worked on making its products accessible, not just to older people who can suffer from multiple minor disabilities that make getting in and out of cars, reading the instruments, and the physical side of driving difficult, but to people with quite specific and severe disabilities.

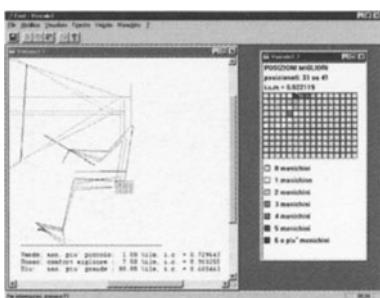
The Autonomy Programme, which is based in Turin, involves the entire Fiat Group, and explores ways in which technology and ergonomics can be effectively applied to meeting the mobility needs of disabled and older people. This is done with a keen eye on the commercial and competitive potential of integrating those needs with mainstream vehicle development. Innovation is of paramount importance in the modern vehicle market, and so research, and technological and ergonomic validation are taken very seriously, in particular where the needs of disabled customers are concerned.

The Autonomy Programme began in 1994 at Fiat Auto, the Italian core of the Fiat Group. The idea was to promote and facilitate mobility for people with reduced physical capabilities. Fiat has since extended the programme and involved all the companies within the Fiat Group in a drive to present itself as a provider of private cars and public service vehicles that offer better mobility for all. Customer satisfaction is of key importance to Fiat so this goal is carefully aligned with the company's overall business strategy.

The Fiat Group programme was launched publicly in 1998, at the Bologna Motor Show, with demonstration vehicles on show. Since then it has been promoted, at the Paris Motor Show in Spain, at the Mobility Road Show in England, in Brussels, in Warsaw, returning to Bologna in 2002 and also in Brazil in 2003. There are some main aspects to the programme: vehicle accessibility, vehicle driveability, mass transport and guidelines. While the private car is important, public transport is a key part of the programme as are farm machinery and other working vehicles. Guidance is important too, both for Fiat's design teams, and also for the dealers and salespeople who interface with the public.

## **Production modifications**

Some examples will demonstrate the progress made under the programme. First, in the private car sector, a range of devices has



been developed that can be fitted to production cars, thus significantly reducing the costs of conversion, and improving safety. For example, to help with getting in and out of the car, a swivelling seat is now produced that is compatible across the Fiat range. User trials were a key component of the whole development programme, leading to the establishment of a mobility assessment centre, where people can test drive the full range of potential vehicle modifications.

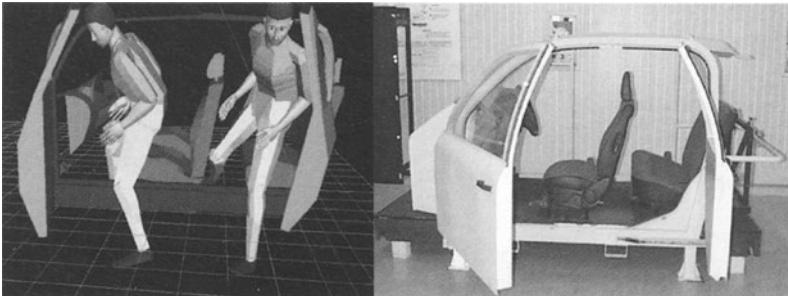
At the centre, driving simulators not only allow people to test vehicles off the public highway, but also give an objective evaluation of driving performance. To date, the company has set up some 14 of these mobility centres in Italy, another 14 across Europe and three in Brazil. As part of the drive for accessibility, Fiat has also developed systems for getting wheelchairs into cars, along with the appropriate anchor points and seat belts, and is working with the MIT Age Lab, in Boston, in order to develop a better understanding of how changing capabilities impact on driving performance.

The private car is only one aspect of the Autonomy Programme. Equally important is public transport and working vehicles, particularly farm machinery. For example, the bus manufacturer manufactures a low-floor bus, which offers easy access, and also has a side-kneeling capability with fine adjustment over 10cms, allowing for accurate alignment with the pavement. This was not easy to achieve, and had many implications of the overall design and engineering. In the end, a new concept had to be developed to allow for the incorporation of the low floor, and the other modifications that had to be made to create a genuinely wheelchair-friendly urban and interurban bus.

Tractor and agricultural equipment manufacturer CMA has put considerable effort into reworking the design of tractor cabins to make them more accessible, and to simplify the performance of tasks through the organisation of levers and buttons. Fiat believes that telematics and electronic systems will be a key element in achieving accessibility. At the moment, there are real problems with usability and with distracting attention from the driving task, and Fiat is working on evaluation and testing of systems, in particular with regard to older users, but with the long-term intention of improving usability for everybody.

Throughout the entire programme, extensive use is made of dimensioned mannequins, to verify entry and exit, to check how easy it is to close the doors, and so on. It is important to understand how such

**Fiat sells around 20,000 cars a year through the Autonomy Programme**



requirements can conflict with each other, for example, wider opening doors make it easier to get in and out of the vehicle, but may make it harder to reach the door again to close it, especially for older people. Such issues can be complex, and it takes constant experimentation and verification to reach a satisfactory solution.

### Adding value

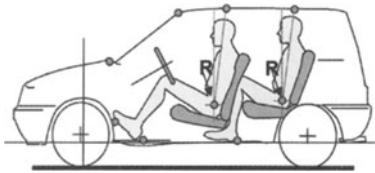
Extending the accessibility or usability of a car, bus or tractor, to include the needs of significant numbers of previously excluded customers makes good commercial sense, improves life quality for those new users, and for many existing users, and builds customer satisfaction. Given that Fiat sells around 20,000 cars a year through the Autonomy programme, this represents a valuable business opportunity, and also positions the company well to meet future consumer demand stimulated by disability legislation. For Fiat this is a win-win, and in many senses the company has been a world leader through the programme, which has had the enthusiastic support of the CEO.

Importantly, these developments are driven by research that in turn drives design. They do not happen in a vacuum. Central to the Autonomy programme is the concept that the whole system, the entire suite of potential modifications, should fit all cars produced by the Fiat Group. This means facing the challenge at the early stages of the design and development process, which requires that the Autonomy Programme is directly linked to product development for each new car. It has also been important to recognise that throughout our lives we all have changing mobility and access needs.

We break arms and legs, we become pregnant, and other things happen to us that result in a temporary loss of capabilities. Our physical size changes, as does our ability to get in and out of vehicles, all of which makes it important to allow for such factors in mainstream



Ingress and egress evaluation with computer simulation and mock-up vehicles.



design. We will never get things 100% right, but that is no reason not to try, and under the Autonomy Programme, and increasingly at Fiat in general, the intention is to deliver inclusive design or design for all, insofar as current technology and manufacturing techniques allow.

The point where these ideas become really exciting is when we look beyond usability and beyond stereotypes – old, young, able-bodied, disabled – and begin to embrace the diversity of human beings and their activities. From this wider perspective we can develop the idea of inclusive design as a route to innovation and to developing things that will work for people in the future, perhaps in ways they have not even dreamt of. We often talk about ‘normalising’ things as part of mass production – the one-size-fits-all approach – but the reality is that there is extreme diversity across the board. Both wheelchairs and skateboards require more room, and understanding diversity at that level is more important than trying to enforce a single standard. Lowered kerbs, ‘kerb cuts’ in America, are a classic example of how one innovation benefits many populations. And the metaphor has been extended to ‘kerb cuts in cyberspace’ in the drive to make the Internet and worldwide web similarly accessible.

The crucial thing for industry is not to look simply at cost, but to balance cost against market potential. In the future, as new technologies, like drive by wire, become ubiquitous, we will be better able to deliver mobility for all without increased costs, but for the present, the important thing is to look at the level of benefit and the number of new consumers whose needs can be included.

**We often talk about  
‘normalising’ things as part  
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size-fits-all approach, but the  
reality is that there is extreme  
diversity across the board**

## Connection, safety and ease-of-use

It is important to have a good, inclusive design, but it is also important to bring that design into the real world as a product that everyone can buy into. At Fiat we have been working on a concept car – the Lancia Nea – in which we have tried to integrate the most advanced technology in ways that make it simple to understand and use, with the overall goal of improving quality of life for everyone on board. There are three key elements to this.

- *Connection:* making the fullest use of all communication possibilities between the vehicle and the passengers, and between the vehicle and the outside environment.
- *Safety:* assisting the driver by monitoring the road and other

vehicles, and by offering support in dangerous situations.

- Ease-of-use: presenting complex and sophisticated technology in ways that are simple and intuitive to understand and operate. For example, every time we change our cars we have to relearn aspects of the driver interface because they are in different places and function differently. In the future, by using these ease of use principles, it may be possible to avoid such problems and present people with a consistent, personalised interface, regardless of vehicle.

The intention was to integrate advanced technology with what we call 'Lancia Principles'. Lancia is an historic Italian brand and mostly known as a quality car, and so an important principle was to maximise comfort onboard, and to combine this with a high level of adaptability to the personal characteristics of driver and passengers, and a new human/machine interface to deliver ease of use. Connection and communication are delivered through innovative telematic services, while safety is achieved through a 'virtual safety belt'. More than a physical seat belt, by monitoring road conditions and the state of the vehicle this anticipates problems and corrects for them before an emergency occurs, and can take emergency action in a true crisis. These three key components: preventative safety; human-vehicle interaction, and telematics, together make the Lancia Nea a highly accessible and customisable, production car.

## The Lancia Nea

A quick tour of the Nea will demonstrate how these elements are combined to make the car user-friendly. The Nea never sleeps, it waits for you, the windows are dark to hide the interior and the items inside. The car becomes alive when it receives your personal electronic signal. It recognises you and searches for your preferences and driving style. As a first gesture of welcome the windows become clear and the interior lights come on. You don't need the key to enter, simply touch the external sensor. The doors open on their own. The driver's seat moves back and turns outward. All you have to do is sit down while the Nea adjusts the head restraints, seat belts, steering and driving position, and closes the door automatically. A word of welcome appears on the central display.

**Human-vehicle interaction, and telematics, together make the Lancia Nea highly accessible and customisable**



Lancia Nea concept model.

**When necessary, the car brakes automatically. If the stopping distance is too short it avoids collision and changes its line after checking the surrounding situation**

There are no rear view mirrors, instead three screens display images that are taken by three exterior TV cameras, so that you can see everything going on around the Nea without taking your eyes off the road. The car has no keys, not even for the ignition. A single movement will suffice to set you off on your journey. The engine comes on when you touch the central screen. The Nea can also receive your access code and a host of other information by mobile phone – how many people you have with you, where you intend to sit and the temperature you want. When you arrive the Lancia Nea moves the front seat forward to make access easier for back seat passengers. The four-zone system means that everyone can find their ideal climate. The navigation system is activated by a voice command, and is connected to the Internet to provide you with all the information you will need during your trip. The car identifies and interprets your requirements, decides on the best routes and indicates places of interest on the way. Electronic communication devices allow passengers to work or play multi-media games. Your favourite music is stored on a hard disc and can be played back on request.

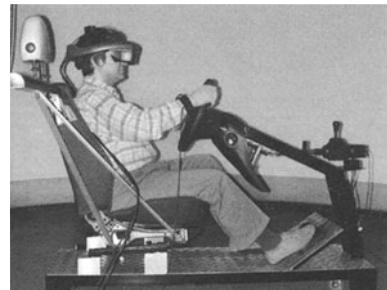
The accident prediction and avoidance system can be activated on request, as part of a 'virtual seat belt' that keeps the car in its lane automatically, while maintaining a safe distance between you and the car in front depending upon speed. These functions are very important particularly in conditions of poor visibility. When necessary, the car brakes automatically. If the stopping distance is too short it avoids collision and changes its line after checking the surrounding situation. In heavy traffic a stop and go system makes the Nea stop and start up again whenever the car in front stops and starts. These innovative functions are made possible by a system of sensors consisting of: at the front a long range radar capable of identifying obstacles up to 140 metres ahead; three TV cameras to maintain lane position and survey the immediate surroundings of the vehicle; two rear-view TV cameras mounted one on either side, with an additional camera to fill in any blind spots; three short range radars to detect the nearness of obstacles on either side; and an additional TV camera at the back which, in combination with four-wheel steering, assists with parking.

## Future directions

The Nea was presented, not as a virtual concept, but as a working demonstration vehicle at the Paris motor show in 2000, and at the Intelligent Transport System exhibition in Turin the same year. But the next step is to look at the ergonomics and interior from the point of view of better integrating the human being and the driving environment. We can arrive at objective measurements for the environment but to model human beings in the same way is not at all easy, as people are an amalgam of subjective and objective factors that vary greatly from person to person. However, in practical terms we are beginning to develop robust models for the assessment of entry and exit, posture and the usability of controls, seat comfort, visibility analyses, that include the capabilities of elderly and disabled people.

These models allow us to explore different design strategies prior to implementation. For example, in dealing with getting in and out of the vehicle, we can look at movement ranges for specific groups, and the ways in which these interact with ways of opening and closing doors. We look at posture, which is very important for professional drivers of buses or tractors who can be seated for 8 or more hours a day. We carry out systematic evaluations of the comfort of seating, using pressure map evaluation, along with subjective testing. This is particularly important for people with special needs, and we are moving towards individual (and automated) customisation as a long-term solution. On the basis of extensive user tests and observations we have now developed 3D human-mechanical models, which can be configured to represent different percentiles, different heights, weights and ages. This is important because not all people fit neatly within standard 5–95 percentiles, and apart from the 10% theoretically excluded by these measures, individual variation means that for certain tasks, higher numbers can be excluded. What is important for us is to be able to deliver the best possible solution for any user, within a standard car, even if this requires special adaptations to the vehicle.

Vision analysis is important too, because shifting focus, from the road to the dashboard takes time and slows reactions, especially for the older eye, and if the lighting within the car is very different to that outside. To extend this work we are building a bigger lab in the resource centre, and are working extensively in virtual reality because of the flexibility it allows in testing and developing solutions well



Assessments in virtual reality.

**This in turn will allow us to focus more on people and their diverse mobility needs and capabilities**

before they go on the market. Users can now test drive new designs for specific elements, and experience new driving styles and systems in virtual reality. This allows Fiat to consumer test, for example how new seats will function in a variety of car bodies, before investing in production. We are currently evaluating the reaction of people to the ideas embodied in the Nea concept, and in particular looking at the potential of drive-by-wire systems, which do away with the need for mechanical links between controls, like the steering wheel and pedals and the elements they control.

The introduction of this technology will open up the possibilities of developing customisable and personalised interfaces and controlling vehicles in very different ways. This in turn will allow us to focus more on people and their diverse mobility needs and capabilities, and move away from the immediate challenges of making vehicles more physically accessible, towards a future where cars adapt to the needs of their drivers and passengers. It will also allow us to move away from the model of special adaptations to one of low-cost cars with a high level of built in adaptability and a range of interfaces that effectively accommodate the whole population.

## Acknowledgements

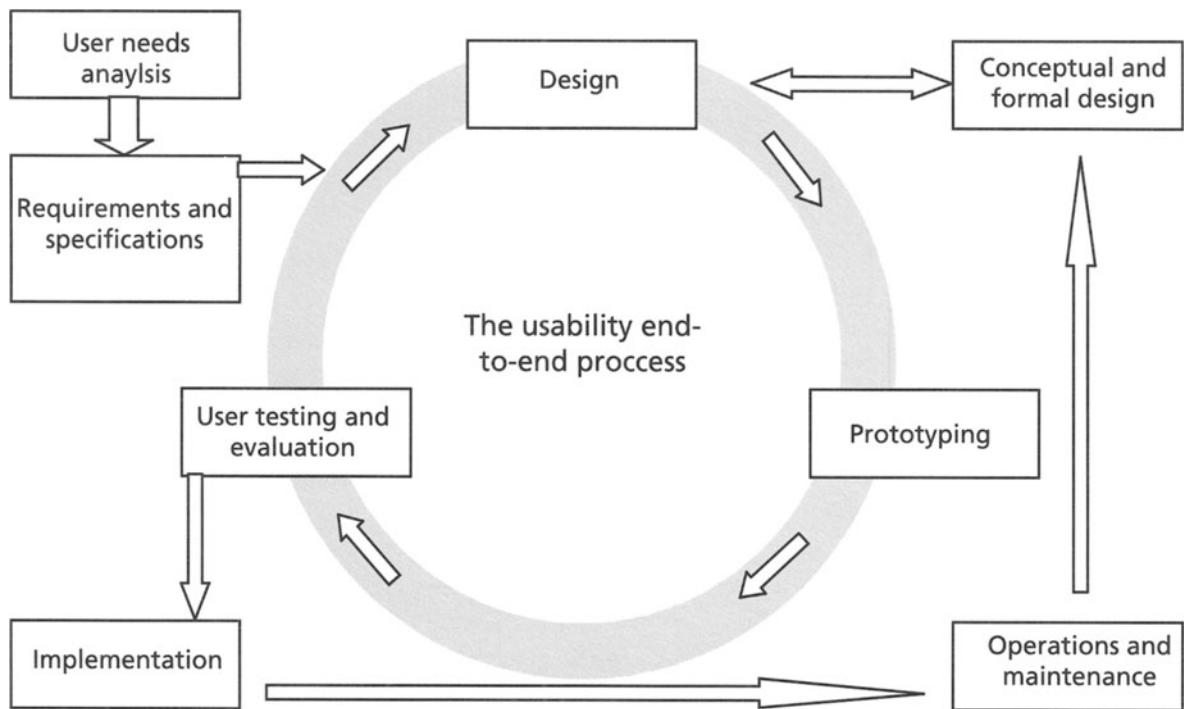
This chapter was based on presentations made at the INCLUDE 2001 conference at the Royal College of Art in March 2001. Alessandro Coda's groundbreaking work on the Fiat Autonomy Programme was honoured at the conference with an award for leadership in inclusive design made by the INCLUDE Scientific Committee. All images courtesy of Fiat Group



## Chapter 14

# Internet usability

Jeff Patmore and Lisa Mahoney  
BT Exact Technologies



The internet and world wide web have already become an integral part of our lives. Even if we attempt to ignore them, messages about this new medium constantly bombard us: 'the URL is this', 'the web-site is that'. In the office, academic environment and even in our homes, many of us could not carry out our daily tasks without it, but we all crave better usability. The Web is constantly changing and evolving, with some content being lost while other content is added. This ongoing evolution gives us the opportunity to make the Internet something that is easy and simple to use, whilst retaining the tremendous 'power' that it provides us all with. At BT exact we have developed a methodology and toolset that has enabled us to work with our clients and customers to develop Internet services with high usability. This chapter describes our approach and methods.

We are at a unique moment in history when human nature has, for the first time, met a technology of comparable complexity.

The outcome of this moment will be extensions of individuals and communities by technologies which are simultaneously global, pervasive and intimate.

(Kenneth Haase, Director MIT Media Lab Europe, 2002)

With this bold statement in mind, in order to discuss the issues of Internet usability we must first understand the medium itself and a little of its history. This is a medium that has developed without limitations either on its size or its content; in fact part of its strength is this freedom from constraint. However it was, for much of its formative years, steered by academics and technologists who worried more about its function than its form.

This led to a user interface that was unfriendly and difficult to use for anyone outside of a relatively elite group. But as word spread about its power people were prepared to learn how to use it because the benefits far outweighed the difficulty.

Then in 1993 the Mosaic browser became available and the Web was opened up to a much larger audience. Mosaic handled documents, graphics, images and sounds automatically. As more people used it they also added their own content and it continued to grow both in terms of content and number of users. With the ability to handle graphics content changed from mainly text documents to a mixture of graphics and text.

It brought people together and suddenly the world was a much smaller place, with both companies and individuals sharing information, in timescales which would have been thought impossible just a few years previously. A new term appeared in business, to describe very fast timescales, 'Internet Time'.

The Internet is a truly disruptive technology; the world has changed as a result of it. An everyday example of this is news that is now global and instant. If a major incident happens anywhere in the world we know about it in seconds, and anyone can contribute this news, even from within heavily censored and controlled areas. We are now able to negotiate commerce in hours rather than days or weeks and we are able to share video information and knowledge across the globe, in real time, albeit currently on a small screen. Although there were fears that the medium would reduce the use of books because people would 'read' everything on the Internet, the reality seems to be that the purchase of books has increased. Availability, via the Internet, would appear to be a major factor in this, coupled with the fact that to date the usability of a book has not yet been bettered.

Lifestyles are also changing, the discussion in the office team room used to be about the TV programme seen the evening before, now it is the web-site discovered and its Internet address. We no longer have to plan our international journeys months in advance, we can access flight information, details of our destination, maps and timetables all from that single tool and, of course, we can then book and pay for the items. In the home we are becoming more aware of this new source of information as almost every TV programme now ends with a web address for associated information.

The Internet continues to grow and evolve every year, but with this growth there is also a loss – content is continually replaced and websites disappear. Some have attempted to archive the Internet (see Further reading, Brewster Kahle). Although there is some concern about the loss of older content this continual evolution allows the Internet content to develop and its design to improve. Today search engines report that there are more than four billion indexed pages on the Internet covering almost any subject that you care to think of.

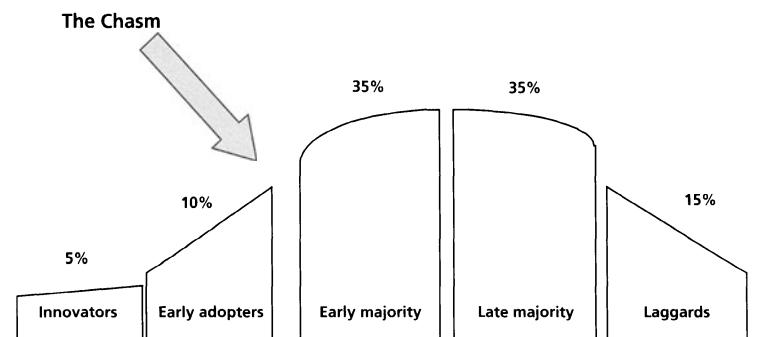
In the latest Internet developments researchers are coupling content to artificial intelligence and personalisation. This should enable us to provide services that really benefit the user. Imagine you can go into

your local library at any time of the day or night and it contains all the contents of every library in the world. What's more, when you get there the librarian asks you what you are looking for and not only finds you all the information you wanted, but also directs you to related information you didn't even know you needed.

This may sound like something from the future but we are able to do this today. Technology is not the barrier; we need to make these services something that anyone can use and that use must be intuitive. The challenge is to develop services that are both useful and usable!

## People and technology

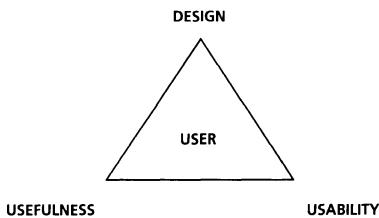
Part of this challenge is to understand how people will use Internet services and how technology-based products and services will be adopted over time.



14.1 Technology adoption cycle.

Figure 14.1 shows the well-known technology adoption cycle. The problem has always been moving technology-based products from the innovator and early adopter stages across into the early and late majority stages.

There will always be a percentage of the population who like 'new toys' and these people will often take up these new products and services very quickly. However to move beyond these early adopters, services need not only to fulfil peoples' wants and needs but also they need to be useful, easy and intuitive to use.



#### 14.2 The cornerstones of creating a good customer experience

## Attracting and retaining customers

A recent Forrester report (June 2001) stated that 77% of users return to content and information sites because of ease-of-use. Only 22% return because the site belongs to a favourite brand.

More and more research is indicating the importance of usability as the key to successful Internet-based products and services. For some, usability is perceived as designing a graphical user interface, in reality it must extend to addressing the entire customer experience around a product or service.

At BT we have developed a methodology to address usability. This builds upon many years of experience in the field and also takes account of developments in the industry. It essentially combines two processes known as User Needs Analysis (UNA) and User Centred Design (UCD).

## What is usability?

There are currently numerous definitions of usability, however we have chosen the definition stated in part 1 of the ISO9241 Standard (BSI, 1998) as the basis of our methodology as it is a recognised standard. In this, usability is defined as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.”

It should be noted that there are two key aspects of this definition. Firstly, the specified users, those for whom the system has been designed and developed, should perceive an interface as being usable. Secondly, usability looks beyond the users’ immediate environment and includes the wider context or situation within which the system is expected to operate. Therefore an interface, which is usable in one context, may be unusable in another and a user interface that users find pleasurable is likely to be more acceptable (Figure 14.2).

A key message in this is that the ‘one size fits all’ approach does not work, however a well designed user interface will suit many.

## Thinking about how people think

Designing high usability Internet services requires that we understand how our end users view the world and more importantly how these views interact with their experiences. This is best explained by an example.

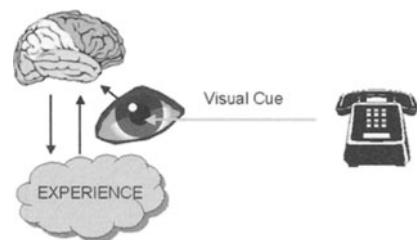
When a phone rings, we instinctively know that if we pick it up the ringing will stop and that if we place the handset to our ear we will almost certainly receive some communication associated with why the phone was ringing. Also if we speak into the microphone, we will be able to communicate a response (Figure 14.3).

We don't really consider any of these things, they are in effect intuitive and are based on experiences that we have learnt and modified over a long period of time. Our reactions are triggered by both auditory and visual cues.

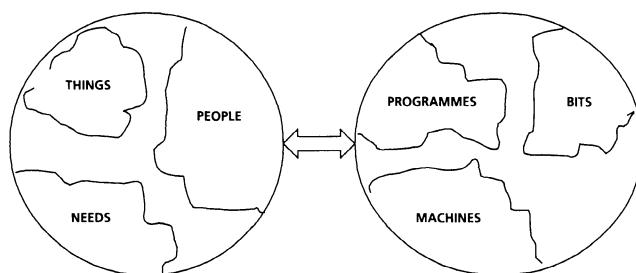
If we consider transferring this line of thought into designing Internet systems, then we should be trying to provide visual and perhaps auditory cues, which would then call upon our experiences and allow us to use an interface in an intuitive way. Interaction with services designed in this way should feel natural and, at best, actually pleasant.

Technology will enable us to do this but the key is in understanding the way in which we interact with these cues. In an ideal situation we should not need any knowledge of the technology to use a new service; in fact it should be obvious (Gibson, 1979). When we consider the interaction of people and machines it is useful to picture two worlds, a world inhabited by ourselves and full of 'things and needs', and a world composed of machines where bits and programmes reign (Figure 14.4). Successful Internet services bridge the gap between these two worlds and this can only be achieved by using development teams comprising people who are equally at ease in both.

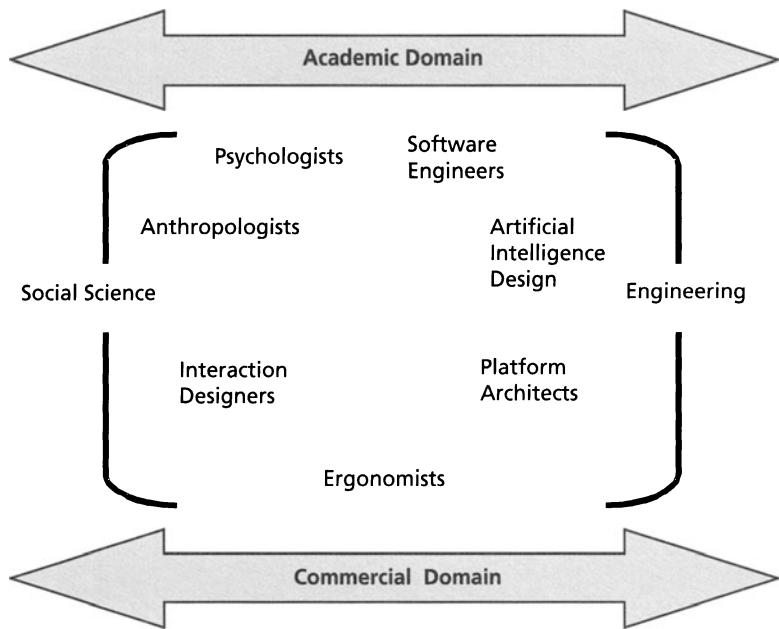
It is not uncommon in academia for departments to collaborate with postgraduate teams coming from a number of disciplines. In



**14.3 Thinking about thinking.**



**14.4 People and machines.**



14.5 The customer experience team.

a department visited recently, a team working on a novel piece of technology comprised two Psychologists, a Software Engineer and a Hardware Engineer. The psychologists were involved in the construction of the technology and the engineers were involved in the interaction design. Working together they were able to determine how people would use the technology and how they could make the interface more intuitive.

The use of multi-disciplinary teams is far less common in industry, but the value of such teams is now being recognised. In our company we have, for many years, employed social scientists in our research departments. More recently, as we moved into Internet services with their demanding development timescales, we have integrated our social scientists with our engineering teams. This has allowed us to put 'user centered design' at the centre of our development and delivery process.

Furthermore, these teams have the opportunity to maintain their links with academia (via a number of partnerships and programmes that support this) so that they can maintain their research contacts whilst focussing on the delivery of projects for clients. The benefit of this is that clients receive deliveries informed by the very latest in

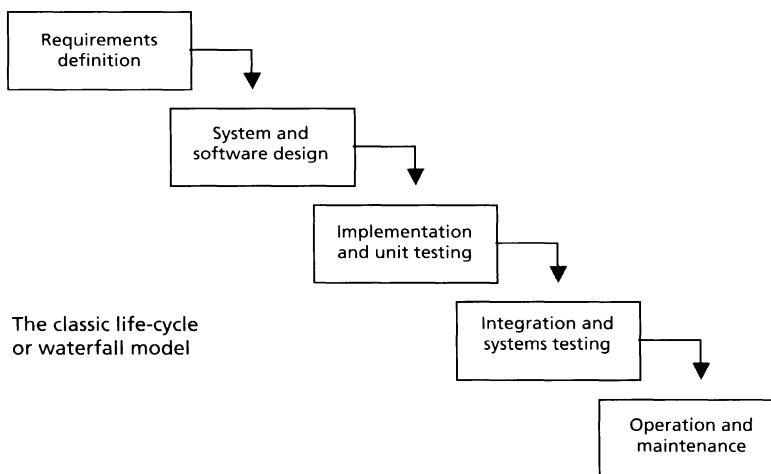
knowledge and understanding, and people on the development projects have the chance to continue their academic interests.

Our group is known as 'The Customer Experience Team'. The team contains psychologists, social anthropologists, interaction designers and ergonomists; also software engineers, platform architects and artificial intelligence designers (Figure 14.5 opposite). They are an integral part of our Internet design and development community and are involved in all new Internet and Multimedia developments.

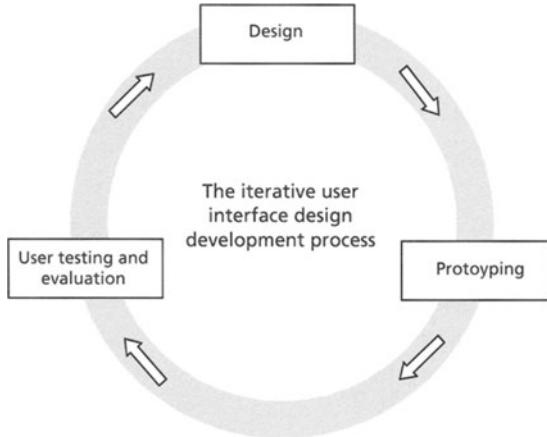
Putting a multi-disciplinary team in place has an additional benefit that is sometimes overlooked, it allows improvement of the communication between the marketing, design and delivery teams. Such multi-disciplinary teams are able to communicate in a language that marketing, design and delivery teams can all understand and, with this, many of the barriers in understanding disappear.

## A different approach

User Centred Design and traditional software engineering take very different approaches to computer system design. Traditionally software developers have treated each phase of the software design life cycle as an independent part of software development, which must be completely satisfied before moving on to the next phase. This is often referred to as the 'classic life cycle', 'waterfall' or 'linear sequential' model, as illustrated in Figure 14.6.

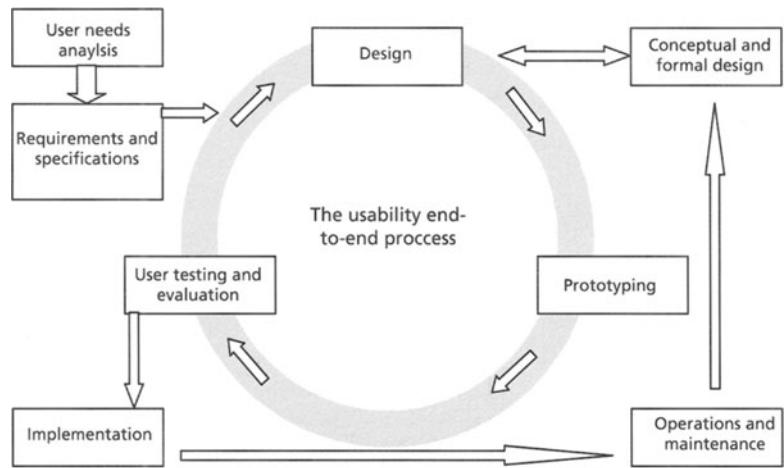


14.6 The classic design lifecycle or waterfall model.



14.7 Iterative user interface design.

The essential difference between the 'classic life cycle' (Figure 14.7) and user centred interface design is that the design and development is based on the premise that users should be involved in all stages throughout the design life cycle. This highly iterative process (Figure 14.8) allows designers to evaluate user feedback at every stage.



14.8 Fully integrated development lifecycle.

Users can be involved through a variety of approaches from simply observing users' working practices as part of collecting system requirements, through using psychologically-based user modelling techniques; to including user representatives on the design team. However, the most important contribution of users is in the testing

and evaluation of the system during both its design and development phases.

Nothing here is particularly new or groundbreaking, but what Figure 14.8 shows is how we bring together requirements capture activities with User Centred Design and couple these to feedback from the operations and maintenance teams. The result is a complete end-to-end process.

Users are included in the prototyping process and their feedback modifies the designs, as does the feedback from the operations and maintenance teams for subsequent releases. In the early stages of the whole process, the developers are coupled very tightly with the product lines and marketing teams.

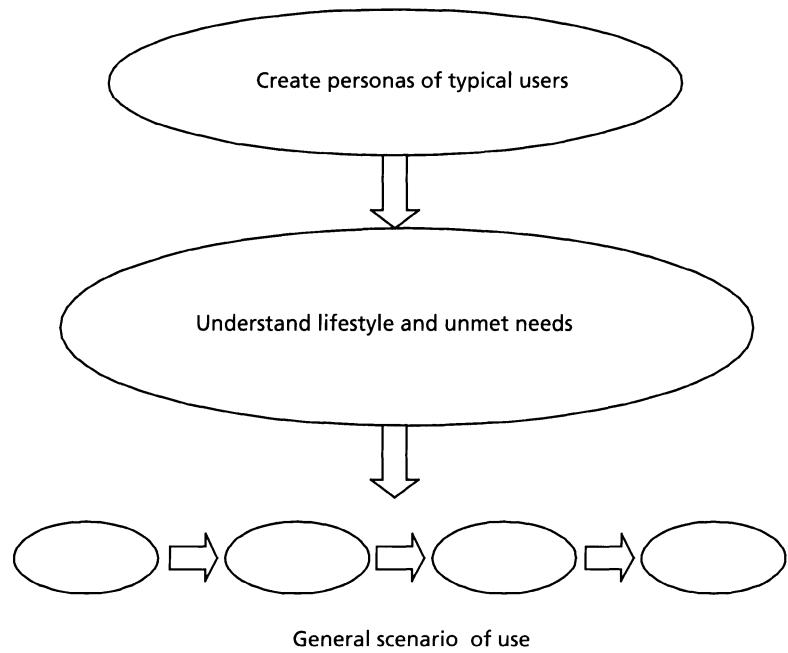
Although there is much history in the whole area of requirements capture, in the Internet space with its very short development timescales, we had to re-think how the initial capturing of requirements takes place and we developed a storyboard type approach to capturing requirements. As a preliminary step, workshops across the team are a useful way to establish initial requirements prior to storyboard commencement. This 'Informing Design' process utilises structured workshops with members of the marketing team and other relevant stakeholders to elicit and develop ideas around the critical issues of:

- Overall objectives.
- User groups/customer segmentation.
- Design constraints.
- Technical constraints.
- Design options.
- Information architecture.
- Navigational models.

This process is an integral part of the 'user needs analysis' process. It lays the foundation for storyboarding, which itself has a number of stages, as shown in Figure 14.9, overleaf.

Personas, which typify segments of the market, are used to guide design decisions by a mixture of empathetic design and visualisation. They help to transform rich qualitative data into crisp representations of target users. These representations assist the development team members (whether designers, marketing managers or project managers), by creating a shared understanding of the real people who will ultimately

use the service or application. “Valid personas reduce work while saving both time and money, because they: serve important market segments, simplify design decisions and help avoid costly re-work” (Forrester Report, August 2001).



14.9 Key steps in the visualisation process.

Scenarios help determine users' needs, as storytelling is known to have the advantage of bringing to life people, places and actions. They give insights into what users value and what they see as aids and obstacles to accomplishing their goals. Choreographed steps through scenarios highlight interaction issues, catch errors and define principles early on at the conceptualisation stage in the design process. Validated by qualitative and quantitative data sources, scenario based design also communicates the vision throughout the organisation to align teams towards the same outcome. “Your users’ needs should always be the deciding factor in how to improve your Web site” (Vividience white paper, December 2000).

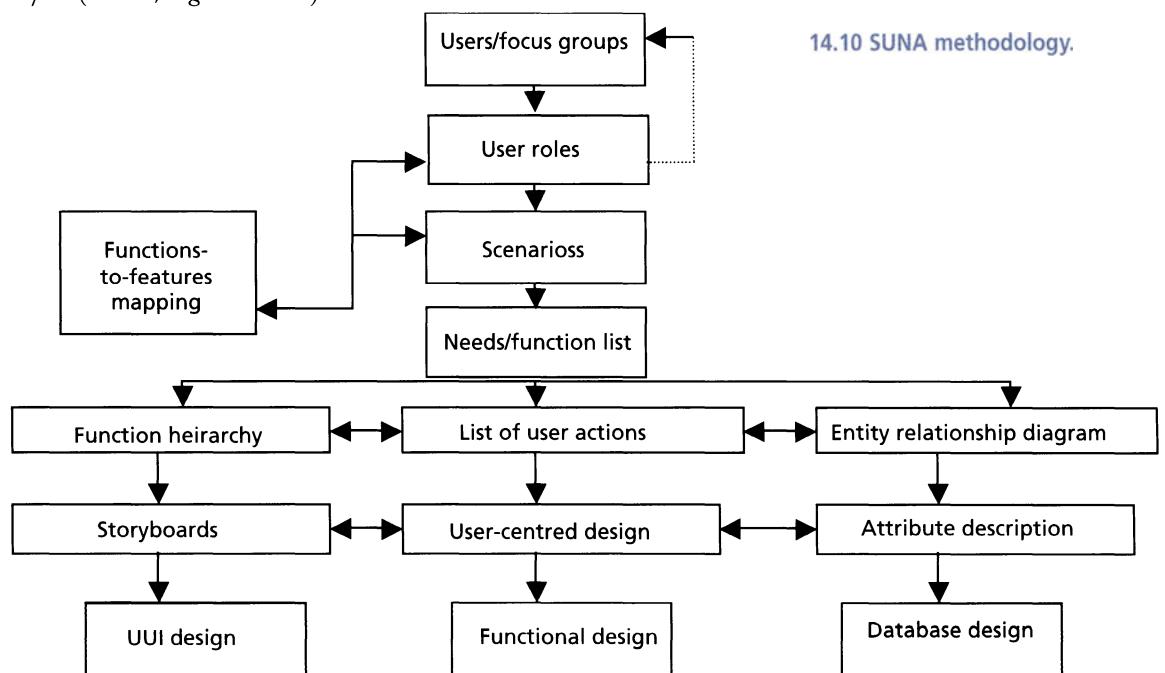
The use of modern graphical tools to produce visualisations and scenarios proves particularly powerful for clients and customers. They can be produced very quickly (days) and this fast turnaround allows an iterative approach to the requirements capture process, while still

keeping timescales short. These visualisations are fully animated and are of a high enough quality to allow testing them with real users. But most importantly, they allow us to ensure that the development team's visualisation of a product or service matches the client's.

So to reiterate, not only does the use of a multi-disciplinary team enhance development activities, but also the same team greatly enhances the communication between marketing teams, designers, technical teams and delivery teams because they are able to speak 'their language'. The overall effect is a major reduction in development time.

### Scenario-based user needs analysis

In order that we can understand the user and their requirements, we use a process called User Needs Analysis. To enhance its effectiveness, a specialist sub-process was developed – Scenario based User Needs Analysis (SUNA, Figure 14.10).



The SUNA methodology utilises a variety of research methods, both qualitative (e.g. focus groups, interviews) and quantitative (e.g. survey), to investigate the needs and feelings of the users. This information is then fed into formal system design through the use of scenarios or

stories. These scenarios are replayed to the users in order to validate the research findings. Scenarios also help put requirements and potential solutions into context for the users. The power of this process is that it formalises the transition between customer research and system design.

### **Understanding the user and context of use**

**By first creating rich pictures of your users and then mapping those onto lifestyle needs, it is possible to build up powerful stories of how the product will be used**

To ensure we offer services that fit customer lifestyles it is necessary to thoroughly understand the context of use of technology in people's lives, as this will affect how they use it and what they use it for. For example, TV has been characterised as a 'lean-back' experience; it is passive, requiring minimum engagement, and is carried out at some distance from the screen, it frequently mediates family communication and often happens in a shared social space.

By contrast, web-surfing is characterised as a 'lean-forward' experience; it requires active engagement, is carried out at close quarters and is typically solitary. As a company potentially offering services that unite and blend these experiences, we can use lifestyle research to help define the service offering and predict its uptake.

Lifestyle analysis can de-risk strategic projects prior to significant investment by understanding customer needs and behaviour to ensure that the technology fits the end user. Development is then led by the customer and not by the technology.

In order to ensure that the users of an Internet service are able to use it intuitively and effectively the design of the service must take account of the user and their context of use. There are a number of aspects to consider when designing Internet services. These are: –

- Who is the user? – why is this person coming to our site? What are their expectations? What are their goals? Where have they come from and where will they go to next? Have we taken account of special considerations such as their age and gender and the conditions under which they will use the product or service? All these will all have an effect on the design of the site and its layout, as will the users' experience or inexperience of the Internet.
- The Design – how should the site be designed to appeal to the target audience? Does the site conform to the company's brand?
- Usability – How easy is it to get around the site? Are screen prompts meaningful to the target user group? Is any registration process easy to follow?

- Usefulness of the Content – with all of the above in mind, how useful will the user find the content on the site?

A good user interface design encourages an easy, natural and engaging interaction between a user and a system and allows the user to carry out their required tasks efficiently. With a really good user interface the user can forget they are using a computer system and just get on with what they want to do.

## Working with a usability tool-kit

Traditional usability methods have, in the main, been developed in academic environments and are often not effective when deployed in a modern business context. To meet these demands, we have assembled a ‘tool-kit’ that enables our teams to work closely with clients and customers and to fulfil their needs of producing clear guidance and design in very short timescales across a diversity of product and service developments.

## A qualitative approach

It is noticeable that the toolkit comprises mainly qualitative methods. This is due to many years of experience of refining best practice in understanding users and we have found qualitative methods consistently produce the richest and most accurate data.

Such early sampling also gives useful background domain knowledge

Quantitative studies have their place and often are valuable tools early in a study to get initial understanding of a user population. This is especially useful where there may not be a known segmentation of the user group and assists with later sampling to ensure the most appropriate population is used to acquire test participants. Such early sampling also gives useful background domain knowledge, which is particularly useful where a product that is a conceptual development of an existing technology is being investigated, and therefore information about usage or take-up of the technology is valuable.

The greatest risk with such broad quantitative surveys is when they are used to inform the design stage of a technology product or service. For reasons that have yet to be fully understood, individuals answering surveys have a strong tendency to generalise their views to what they believe will fit with their perception of the wider population. Those taking part in surveys are adept at commenting at what they believe

**There is a strong argument that when it comes to the design of technology services, usability professionals are far better placed to do this than market researchers**

they would do, but the reality is that this rarely bears any relationship to what they actually do when confronted with that situation.

An example of this is a study undertaken by BT a number of years ago of a new service that used automated speech. The performance data from the project indicated that success rates with the product were extremely high, with low errors and no users having to recourse to help features. The questionnaire used to understand user perceptions of the service was a combination of Likert-rating style questions and in-depth probes. A number of participants in the study who had used the service very successfully (i.e. with no errors or evident confusion) rated the service low on some of the Likert-scales.

Intrigued, the experimenter used the probe questions to explore this, and found participants saying things like:

“I gave it a rating of ‘x’ because I was thinking of my Gran, and I don’t think she’d be able to use something like this...”

or:

“Well, yes, I put that because I like it, but I don’t think other people will”.

This phenomenon is one that the majority of usability practitioners are familiar with and is the major reason for adopting qualitative and especially observational techniques. Quite simply, people are the worst predictors of their own behaviour and cannot be relied upon in a survey to give responses that can be used to make design decisions.

This also applies to an extent to some focus groups, where as well as the well-known risks of polarisation and group think, there is a strong tendency for participants in such groups to come up with feature-rich wish-lists. These have little foundation in how they actually run their lives, or what they really need. Whilst an experienced facilitator can control polarisation and group-think, the wish-list phenomenon cannot be controlled without a change in methodology.

This of course is not to say that focus groups are without worth, but they must be used at the right time, in the right way, for the right reasons. There is a strong argument that when it comes to the design of technology services, usability professionals are far better placed to do this than market researchers. As such, the tool-kit below refers to the use of ‘experi-groups’; a hybrid of focus groups and user trials, that have shown to be more predictive than focus group alone.

## The usability tool kit

### Scenarios and Prototypes

Creating user personas is a valuable tool in understanding how and why a product will be used. Prototypes can support this and we use them as the next step on from scenario design and they bring a product ‘to life’ early in the design cycle to enable more effective development. It is often easier to attempt to design against a given user segmentation or known population, but this often results in the ‘one size fits all’ mentality and details can be overlooked.

By first creating rich pictures of your users and then mapping those onto lifestyle needs, it is possible to build up powerful stories of how the product will be used. By understanding the service in the context of ‘real’ users with ‘real’ lives, new perspectives are gained into how the product should behave and, frequently new requirements are revealed.

Storyboards also have the power that they are easily accessible by all elements of a development team, from engineers through to marketers, which aids significantly to inter-project communication.

A health-check will typically capture up to 80% of the usability problems users might be expected to encounter

### Health-checks

A usability health-check (or heuristic evaluation as it is sometimes called) is a way of quickly highlighting problem areas within a service. Our health-check provides important information on where a product might fail and advice on what type of work could be implemented to correct the faults.

The assessment uses a set of internationally validated usability criteria, which cover aspects such as information architecture, use of graphics, ability of users to meet their goals, errors and support, terminology used and also accessibility issues. These are then prioritised into issues that will have major, through to minimum impact on the service, and suggestions can also be made on how to alleviate the problems.

The value of the health-check is that it is very quick to conduct, yet still utilises the skills of usability professionals in a highly effective way. A health-check will typically capture up to 80% of the usability problems users might be expected to encounter. Although the findings are not validated by user input, our experience has shown that the use of these methods is ideal for an initial look at a service, prior to in-depth analysis.

## Service audits

These are a comprehensive assessment of a product or service, often applied when problems become evident but the immediate cause cannot easily be ascertained. This technique has been shown to be particularly successful in the assessment of product helpdesks, where high call volumes have been generated by unknown problems.

Frequently, a business will already have much of the information required for conducting such audits, with data such as customer complaints, usage patterns, product return rates, staff feedback and data flows all being useful indicators of where issues may lie. Despite having such data, companies will not have looked at it holistically or from the perspective of a usability professional.

Discoveries of underlying issues can often be made by simply looking across data sets from a user-centred perspective. Using this data also allows the creation of detailed cost/benefit/impact models, which are of immense value when prioritising any subsequent redesign activities.

## Usability testing

This involves taking a product or prototype out to its target audience and conducting studies on how the service is used and how users react, to understand where the usability problems may lie.

This is not market research, it is the detailed study of how people and systems interact and is typically conducted by psychologists who specialise in Human-Computer Interaction (HCI). Testing can be conducted under laboratory controlled conditions, or out in the field as required. Laboratory conditions are convenient because they provide a reception area for those users attending, have video and sound equipment, phone lines and other requirements to hand.

If viewing suites are available these can offer a particular advantage where stakeholders in the product may need to better understand the real issues that users face and being able to watch user-testing is an ideal way to do so. The drawback with such an approach is that users can often feel nervous and may behave slightly differently in their strange new surroundings.

Our experience is that users are often more compliant in laboratory situations, so may be less vocal in their feedback, or more willing to persist in a task when otherwise they would have stopped. These

problems are overcome by testing in more natural environments where users tend to be more relaxed and offer more realistic behaviours.

Although harder to control and harder for third-party viewing, they often produce richer data.

## Card sorting

This is a technique that explores how people group or organise items, it allows us to organise the content of a service so that it has high usability. Card sorts are usually undertaken in the early stages of the redesign of a service, as a way of ensuring the content organisation meets the understanding and expectations of those using it.

It is a method of semantic organisation that represents the user by involving a small set of them in allocating categories of information or activities and then allocating individual items to each category. This activity can also guide the lexicon used on the site.

We have found that card sorting is most valuable when performed across representative customer segments.

## Greeking (checking affordance)

This methodology allows us to understand whether the design of an interface is intuitive. Text is replaced by 'Greek' and users asked what they understand about aspects of the interface. This is typically used as part of the iterative design process. Once early structures for the interface have been determined, a set of different layout options can be 'greeked' and given to users for feedback. It is also a way of tapping into the fundamental 'affordances' of an interface before content is laid on top.

## Acceptance criteria

These are used early in product creation to clearly prioritise the features that will benefit both users and the business. Maximum effort should be focussed on the design of these criteria to enable the creation of a product that will serve users and deliver revenues.

They also set standards for what a service will do and discourage design decisions based on personal preferences or committees.

**Experi-groups are the next step on from a focus group and can involve workshop style sessions, paper prototypes ... right through to alpha trial products**

Examples of criteria:

- 95% of users will be satisfied or very satisfied with the service
- 80% of users will be able to find the service they require within 10 seconds of looking at the website
- The website homepage will download within 20 seconds over a 56k modem on a normal public service telephone network phone line.

## Focus groups and experi-groups

Focus groups are used early on in product or service creation to understand the needs of users. The emphasis is on lifestyles and unmet needs rather than a 'what would you do with technology X?' or 'what do you think of this product or service?' This concentration on lifestyles avoids the 'wish-list' phenomenon, often associated with focus groups.

For some focus groups novel methodologies can be adopted to encourage users to articulate needs that they may not be fully aware of themselves. They can often be good opportunities to do an early 'card sort' or to investigate new terminologies with users. Experi-groups are the next step on from a focus group and can involve workshop style sessions, paper prototypes and greeked services, right through to alpha trial products. It is essential that groups are run by trained moderators, who ensure equal participation by group members and unbiased discussions.

## Accessibility for web issues

It is important that web pages can be used by both consumer and business screen readers (Text to Speech). Also designing for the elderly or arthritic and providing web links with a large 'click area' for 'wobbly' mice provides enormous benefit for these users. Other things, such as making a site compatible with keyboard shortcuts, using high contrast and legible fonts and conducting inclusive usability testing, will all aid accessibility.

A problem often overlooked in web design is the design of interfaces for colour-blind users. Approximately 1 in 12 males are colour-blind and we have produced colour conversion charts so that web designers can address this, ensuring that sites can be used by all. The accessibility standards are:

- US Government Section 508 standard
- Bobby AAA standards

- W3C International guidance
- UK Government website guidelines

## Video diaries

This is a blend of contextual enquiry and ethnographic style often known as 'hanging out'. It involves the usability researcher spending time in the environment of the participant and recording significant events as they arise. It has been found to be particularly useful in the identification of user/technology issues that take more than a few hours to discover. Our researchers have been known to camp in participants' back gardens during this procedure (with their permission of course). The footage from such video diaries is extremely powerful and has been known to convince even the most hardened cynic of the value of using user centred design.

## Unwrapping or 'out of the box' testing

This is another technique founded on the principles of contextual enquiry. One of the most critical periods in a user's experience is their very first usage of a product or service. However, capturing that moment is usually only done retrospectively and often at a time when users may have a declining memory of the event if it was more than a few days before.

Unwrapping trials involve the recruitment of users at the point of purchase. Researchers then accompany them home to observe their first usage of the product or service, covering issues such as packaging, user guide effectiveness and installation through to first usage. Surprisingly, the majority of users are only too happy for this intrusion.

For the usability professional, it is an invaluable opportunity to observe users first hand with a product in their 'own' environment. This not only makes users more relaxed (and consequently more verbose which is always helpful), but highlights environmental issues that are not found when using a formal usability testing suite.

An example of the learning achieved in this way was the realisation that for many people, phone and power sockets are not always adjacent. Therefore any product or service which requires connection to both needs to be provided with a suitable length of lead to address this, and the installation of new phone sockets should be within easy range of power sockets where possible.

**Having frustrated customers can result in up to 50% reductions in trading volumes, and drive away 40% of repeat traffic**

## The cost of getting it wrong

Designing around users is not simply about creating usable services for their enjoyment, it has significant underlying business benefits. For the business that fails to ignore the importance of this, there are some sobering statistics.

For example, having frustrated customers can result in up to 50% reductions in trading volumes, and drive away 40% of repeat traffic. Plus there is the old adage that every dissatisfied customer tells ten others, which has the impact of further reduced revenues and an eroded brand.

Although many businesses now understand the importance of offering a complete ‘customer experience’, there are still some who believe that putting the customer at the centre of design is ‘pandering’ to customer desires. For those who have such doubts, Table 14.1 is a very clear statement of the massive impact customer satisfaction has on revenues. What it shows is that there is a strong correlation between attitudes and behaviours. Customers who are dissatisfied do not just passively feel annoyed or just grumble a bit, they vote with their feet.

Furthermore, what this research shows is that it is not enough to satisfy your customers, because satisfaction means that only 12% intend to re-purchase from you. The only way to ensure the future of your business is to exceed customer expectations, and, if possible, delight them. This chapter has shown some of the steps that can be taken to ensure the design of usable, intuitive, and inclusive products and services, with the emphasis on the entire customer experience, and a focus on customers throughout the entire product development lifecycle.

It is only by this total focus on customers and their needs that business can even begin to hope of getting to the ‘holy grail’ of customer delight. All of this is possible, but only with the right teams, the right approach and the right attitude.

## In summary

The key elements of internet usability are:

- User – understanding the users’ tasks and the things they are trying to accomplish
- Systems – ensuring that systems are ‘fit for purpose’ and scaled appropriately
- Engineering – involving users in the design cycle and testing of prototypes

| Customer perception |   | Intent to re-purchase | Willing to recommend |
|---------------------|---|-----------------------|----------------------|
| A                   | Exceeded my expectations – I am delighted                                 | 90%                   | 96%                  |
| B                   | Exceeded my expectations – I am pleased                                   | 56%                   | 71%                  |
| C                   | Neutral – I am satisfied  | 12%                   | 19%                  |
| D                   | Failed to meet my expectations – I am unhappy                             | 3%                    | 10%                  |
| E                   | Failed to meet my expectations and a very poor experience – I am outraged | 7%                    | 7%                   |

- Relationships – understanding how users interact with systems – from a user perspective
- Solutions – using an iterative approach and learning from user feedback.

14.11 The relationship between customer satisfaction and purchasing (BT consumer research 2001).

## User first – technology second

Usability matters because it can enrich customers' experience by offering services that fit their lifestyles in a compelling manner, and can provide strategic differentiation for a product or service. Lastly of course, it's about being passionate about delivering what customers really want, in a way that they can easily understand and use!

## Acknowledgements

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## Further reading

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Part 11: usability

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## Chapter 15

# Everyday inclusive design

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Designing inclusively presents some unique challenges to product designers working within the highly competitive consultancy environment. This chapter will discuss some of the practical experiences that Alloy has had as a product design consultancy pursuing an inclusive design agenda, reflecting on what this has taught us about carrying out inclusive design – everyday. The chapter will discuss aspects of the inclusive design experience, investigate why we should design inclusively, what issues are facing inclusive designers, and ultimately take a look at how we might integrate users into the design process. Illustrating these points are two case studies, one commercial, one speculative. The Freestyle 60 for BT Communications Products will show how we employed inclusive design principles in the design of a mass consumer product. Kettlesense, a non-commercial project carried out in response to the 2001 DBA Design Challenge, will illustrate a more idealistic approach.

There are a number of questions that arise when considering the role of inclusive design within the product design consultancy environment. Practical experience of running inclusive design projects from both a commercial and non-commercial perspective can help to provide some answers to these questions from a design consultancy perspective. Gleaned as a result of our collective experience as a design consultancy, these insights may be of value to those considering implementing an inclusive design policy, or serve as a benchmark against which other experiences can be compared.

Some of the key questions are:

- What does inclusive design mean to product designers?
- What effect does thinking inclusively have to both our design experience and to the solutions and artefacts that result?
- Why should we design inclusively?
- What are the key issues facing the inclusive designer and how can we best integrate users into the design process?

Inclusive design has been specified as “...a process whereby designers and manufacturers ensure that their products and services address the needs of the widest possible audience” (DTI Foresight, 2000).

It is clear that inclusive design needs to draw back from the American defined term of universal design, with its connotations of all encompassing consideration. But more importantly, it must move on

**At the core of our company philosophy lies a commitment to better design and better experiences for both clients and users**

from the stereotypical approaches of the past, typified by descriptors such as 'New Design for Old', or 'designing for special needs'. Then, it was seen as a specific form of design catering for a specific group of people with specific needs. Now, we can see that it needs to become much more general, more diverse, and critically, more everyday.

However, it can be seen that this generality goes further than just considering the design of the artefact itself. To fully embrace inclusivity, we must consider all aspects of a design project, taking on board not only the user requirements, but also the client's needs and market demands. Within parameters, a truly inclusive design needs to be comprehensively inclusive, taking into consideration the needs of all parties involved. For example, there is little point in making the perfect product if it is completely unaffordable by the intended market. These comprehensive considerations are the ones that we, as product designers, employ on a daily basis across a wide range of design projects, so why should there be any difference for inclusive design?

At Alloy we describe ourselves as an experience-led product design consultancy. At the core of our company philosophy lies a commitment to better design and better experiences for both clients and users. This paper will argue that to achieve these better designs and better experiences, to improve the design of everyday things for a broader and more diverse range of users, we must practice inclusive design as an everyday activity.

## The inclusive design experience

Product designers may have had more exposure to inclusive design than is at first apparent. Experience can be drawn from projects carried out as part of university degrees or from projects that have had an especially critical user oriented element. Looking a little more closely at the way in which briefs are specified or at the results of user trials can reveal insights into both how we have thought about products in the past, and how we should perhaps be thinking about them within a more inclusive context.

## Historic experiences

As a design discipline, product design has probably got a stronger history in inclusive design practice than any other. In the college environment, certain aspects of inclusivity have been addressed under

banners such as 'New Design for Old', as part of the RSA Student Design Awards. In the more specialist design sectors, design for 'special needs' plays a vital role in the design of targeted products that satisfy the specific requirements of certain users. The lynchpin of a designer's training lies in considering the needs and requirements of end users.

At some point in their careers, most product designers will have carried out a design project that will have encompassed some form of inclusive thinking; they may have worked on public access projects, where they needed to consider the mobility requirements of a broad range of groups; perhaps they might have carried out an ergonomic study of a handle, considering how easy the handle is to grip and turn; perhaps they had to consider the functionality of a button layout, considering the needs and capabilities of a specific target group.

This suggests that in order to design inclusively, designers need to interrogate their own experiences and draw on these for inspiration. Further, although this book will provide a very clear set of guidance as to what the key issues are across the board, from a specific product design point of view, the benefits of the approach are most likely to be achieved by awareness, a rigorous design process and common sense.

**There are two key experiences that are likely to shift the designer's worldview in this respect; carrying out a project where inclusion is a specific goal, or experiencing some lessening of ability at first hand**

## Perspectives and attitudes

To the fully able designer, signage appears easy enough to read, kettles appear easy enough to lift, cars appear easy enough to drive. Decisions about what we buy are taken partially on elements of functionality and ease of use, but often, a greater percentage of our decision-making will be based on what we like, on brand and advertising, on cost and availability. There are two key experiences that are likely to shift the designer's worldview in this respect; carrying out a project where inclusion is a specific goal, or experiencing some lessening of ability at first hand.

It is likely that having been through one of these experiences, the designer's perspective will fundamentally change and their observation of both positive and negative examples will increase significantly. This will have the effect of significantly raising the general awareness of the designer to needs and requirements of others, both at a specific and general level and it is likely that they will question the status quo at a much more fundamental level than before. The needs of a wider range

if users will become part of the constraint set that is pursued within all design projects.

### Theory and practice

Although inclusive design has a strong history in the product design profession, there is little understanding about many of the more theoretical aspects of its practice. The design industry is just waking up to the opportunities and challenges of inclusivity, and most of the current knowledge gained by the profession has been through direct experience, rather than the transfer of knowledge from a research basis. Designers need help in knowing the path to follow to elicit the correct information from research activities, how to work with the tools available and how to evaluate solutions derived. It is essential that knowledge is widely disseminated and that research findings are presented in a manner that can be implemented effectively and efficiently by designers.

Whilst these simulations might provide some value, there is no substitute for the involvement of end users as unequivocal experts in their field

Establishing the key issues and criteria (essentially, the brief) within a project is the key starting point for inclusivity. Experience suggests that an inclusive design process can involve more phases, iterations and consultations than is perhaps commonplace within more conventional design projects. It is essential to involve experts and users in the process and the initial research investigation may prove to be the most invaluable phase of the project. Using the information gathered during this phase will help build a comprehensive set of constraints, to generate a challenging and stimulating brief, and ultimately provide the optimum platform for creativity and innovation.

### Involving users

The involvement of users in the process is critical. Simulations such as the Ford 'third age suit' put young designers in the place of those with limited mobility, cataracts and so on. However it is argued (Ormerod, 2002) that such implementations can be misleading, as the designers have no experience of 'coping', of getting used to the situation over time, or in the case of failing eyesight, in their other senses becoming enhanced to accommodate. Further, the designers can remove the suit and so go back to being 'normal' and attitudinal problems are not explored. So, whilst these simulations might provide some value, there

is no substitute for the involvement of end users as unequivocal experts in their field.

## Professional and commercial experience

The raising of awareness that will result following an empathic interaction with users will go further than looking at specific design problems, issues and solutions. Already, there is a realisation of the enormous potential that it offers the industry as a whole, providing an enormous and stimulating challenge. Intrinsically, understanding and overcoming design exclusion generates a level of creativity and innovation that values content over fashion, and will perhaps reinstate some of the value and integrity to product design that has been lost due to mass production and mass consumerism.

Experience has taught us that inclusive design solutions are commercially viable across the board. It does not cost more to consider a broader range of users when designing a product and potentially, the resulting solutions may be of a much higher quality than before. This can result in the creation of a broader portfolio of work, potentially opening up increased marketing and sales opportunities.

**Graduate product designers are predominantly male, between 20-25 years of age, a mix of age and gender that is not predisposed to considering the needs of a generation it cannot identify with**

## Why design inclusively?

The Economist (2002) claims that there is a dearth of marketing to the over 50s, despite the fact that this age group accounts for 50% of all optional spending in the developed nations. It is believed that there is a parallel lack of understanding within the younger echelons of design consultancy practice. The fact that the majority of advertising is aimed at the young supports the younger designer's view that product design should also focus on the young.

Graduate product designers are predominantly male, between 20-25 years of age, a mix of age and gender that is not predisposed to considering the needs of a generation it cannot identify with. Designing for the young is seen as sexy, designing for the older user is not. Younger designers see their peer group as those who define and create trends, the ones who have the greatest power to influence through purchase decisions; this is a misconception. However, this misapprehension is not really their fault, it is derived as a result of living in a culture that does not value age and is a direct result of the power of popular culture through advertising.

However, it is believed that although an inclusive mindset may not be intrinsic in this group, they are more than capable of rising to the challenge when the problem is presented to them. The consideration of inclusive issues can only be expected to become everyday following immersion or repeated exposure to the subject.

### The scope of inclusive design

Designers have a responsibility to consider inclusive aspects at all levels of their design activity. Approaching a project with the user and functional needs clearly defined right at the start will help to define a comprehensive and challenging brief, and is an approach recommended for every design project. It must be accepted that due to time or financial constraints, user consultation is not always possible within every project, there is no doubt that anything that can be done in this area would be beneficial. Further, spending more time at the beginning of a project, defining the brief and setting the parameters to consider the needs of a wider range of users, can only benefit the resulting solution.

The setting of a more challenging set of constraints at the beginning of a project will, without a doubt, require the design team to think more laterally. This will challenge their assumptions more, encourage them to be more creative and perhaps, ultimately, drive them to design a much more innovative solution than might have originally been conceived. Potentially, the result of setting these constraints to higher levels is that true problem solving will occur. It is unfortunately a reality that in many cases, true rigorous problem solving is rare in mainstream consumer product design.

In a marketplace driven by features, style, cost and time to market, the elements of problem solving are often small and the compression of timescales precludes a truly rigorous comprehensive design process. Creativity may be limited to making a product 'look' different, rather than 'be' different. Inclusivity therefore offers us much more than perhaps first perceived. It can offer a catalytic design environment for enhanced creativity and provide the opportunity for more creative solutions than had initially been conceived for a 'received' product type. As will be shown in the second of the two case studies presented here, the Kettlesense project (Figure 15.1) is an ideal example of how the identification of new constraints and the application of lateral thinking

can create a totally new product type within a seemingly saturated marketplace.

Kettlesense, however, is an illustration of a relatively extreme shift in product type. It is important to acknowledge that innovations can be large or small. Often the small wins are the ones that will make a greater difference, as they can perhaps be implemented more quickly, more cheaply and may not require a change in attitude. Whilst we should strive for the big wins, it needs to be accepted that a completely new product requires enormous investments in both time and money, and will undoubtedly require complete commitment from all partners in the project. Both are valid goals for the product designer in the pursuit of design inclusion.

### A clear argument

In the next decade, in the UK alone, the majority of disposable income will be in the hands of the over 50s (Myerson, 2001). Commercially, the arguments for a more inclusive approach are strong and indisputable, and will be expounded at length elsewhere in this book. Specifically however, it offers manufacturers an enormous and expanding marketplace, opportunities for unique selling points and for product ranges in market areas that may have been previously viewed as saturated. For design, there is potential to capitalise on the demands of this newly realised and expanding marketplace. In addition, there are opportunities to be exploited in raising the awareness of existing clients.

The arguments for designing inclusively are clear and simple. Most designers would argue that their prime consideration is for the end user. Designers therefore have a responsibility to make sure that this is what they are actually doing. They must be able to demonstrate that they are not just considering, but actually acting on the needs of as wide a range of end users as possible. Designing inclusively is without a doubt designing better, it requires that the constraints within the brief be set wider and higher than normal, with the result that the designer has to be more creative and innovative to overcome them. Inclusive design doesn't have to stop at considerations of age and ability; inclusivity can also extend to sociological issues such as gender, class, ethnicity and culture. In simple terms, the more inclusive a design solution is, the better that design will be for everyone.



15.1 Kettlesense.

Beyond this, the key argument for both clients and designers is that there are clear business benefits to designing inclusively; changing demographics, and the shift in high levels of disposable income to the over 50's all contrive to make this an argument that cannot be ignored.

## What are the issues facing inclusive designers?

One of the main issues facing would-be inclusive designers is having the freedom to actually pursue such an agenda. The issues facing inclusive designers fall into two main areas: external, client-centred issues, and internal, design-team-centred issues.

### Client-centred issues

One of the biggest challenges when setting out on the inclusive design path is in establishing its value within both the design and client teams. There are two main approaches that can be taken with clients to convince them that there is a strong case for inclusive design. There is a direct approach, where the designer can make the business case prior to a project commencing and try to convince the client team that an inclusive approach will be one that will take this product forward into a new realm of success. This approach is risky but the rewards may be great, and whether or not it is appropriate will depend on many factors. These may include elements such as the longevity of the relationship, the nature of the client and the type of product or product range being designed. The problem with this approach from the client's point of view will be risk management; it may just feel like too big a step to go for an all out inclusive solution that is named as such.

Alternatively, an indirect approach might be employed. Here, the designer might add their own additional constraints to the brief, building in inclusive elements into one or a number of design concepts in the hope that the approach will be ratified by results. Then, the inclusive elements merely become part of an overall sales pitch, which will, as long as it has not strayed too far from the original brief, be completely acceptable.

Neither of these approaches appears particularly appropriate. The direct approach may require too many cultural changes within a client organisation, the indirect approach is apologetic, and contradicts the power of the business case that exists. A compromise approach is therefore proposed as the most appropriate route forward. Designers

need to get involved in the creation of the brief at the earliest stages of the project, either through in-depth consultation with the client, or by challenging the brief that has been proposed. It is believed that the ultimate success of an inclusive project lies in the rigorous identification of all requirements of the brief.

Although it can be difficult to establish the value of inclusive design with clients, the argument for inclusivity can be made in a highly compelling way if it is described in terms of the product appealing to a broader range of consumers, thereby increasing the capacity and potential for sales.

**Seemingly everyday impairments of our ability can provide a starting point for empathy with currently excluded groups of people**

## Design-team-centred issues

Is it perhaps possible that designers feel that in order to design inclusively, they need a new set of tools, theories and props? Although research projects currently under way will undoubtedly reveal a new set of design tools and processes, there are existing tools that designers can draw on immediately

It is important that designers realise that they have been, or will have some form of disability at some point in their lives. These potential experiences need to be recognised, whether in the past they have had a broken ankle, currently need to wear glasses, or one day might have arthritis. These seemingly everyday impairments of our ability can provide a starting point for empathy with currently excluded groups of people. They need to build on this most valuable of tools, empathy; in order to put themselves in the place of others; in order to find out what it is that they really need to know; in order to establish the true criteria and priorities, and therefore the brief that will hopefully spark off the lateral thinking that is at the root of true innovation and creativity. This will also aid the understanding that the need for inclusivity is mainstream, not specialised, but to make things better for everyone.

Common-sense and empathy are good starting points for the would-be inclusive designer, listening carefully to others and analysing the information received, before synthesising into solutions. It is common for designers to believe that they know best about what people want, successful inclusive design depends on listening carefully to the needs and desires of others, empathising with them and remaining open minded about the potential solutions. Some solutions might, at first glance, appear to offer the optimum solution to a

**Wearing yellowed goggles to simulate ageing of the eye cannot enable the designer to understand how visually impaired people are treated when out and about**

problem, but if it can only be afforded by the wealthy, it is as exclusive as a product designed for the dexterous fingers of a highly capable 15 year old.

There is a limited number of tools available to assist designers in this area. A powerful understanding of the difficulties faced by others can be achieved through dialogue and interaction with users, but there is another level of understanding that can be achieved through direct experience. Although the use of simulation aids will undoubtedly give a powerful impression of how it feels to be less able; they cannot be the only tool that is employed. Just as one wouldn't expect a learner driver to be able to drive a car as well as one with experience, a designer using a wheelchair for the first time cannot be expected to manoeuvre it as well as a daily user.

Designers can leave their simulations and return to the 'normality' of their lives, a wheelchair user does not have this luxury. Wearing yellowed goggles to simulate ageing of the eye cannot enable the designer to understand how visually impaired people are treated when out and about. So, although there are a limited number of physical tools available to designers to help them understand how it feels to be less able, there is still considerable room for improvement in this area.

No design solution is 100% perfect, it is an optimum solution derived by negotiating the most appropriate path through the design constraints. Similarly, we should not expect absolute perfection from any inclusively designed solution. More than likely, such solutions will represent stepping stones to improved next generation products. Designers must be prepared to make compromises and develop coping strategies just as users have had to for many years.

### Integrating users into the design process

As has already been discussed, the integration of users into the design process is absolutely essential. The reality of most design projects is that the level of user involvement will be governed by the availability of time and money. However, it is important not to take users for granted, and acknowledge that their time is a highly valuable resource. The design team must therefore ensure that any knowledge elicited through user centred study is of adequate value that it might contribute to a better design solution.

As was said at the INCLUDE 2001 conference, ‘quick and dirty is better than not at all’ (Green, 2001). There is a perception that integrating users into the process involves expensive market research companies and specialist skills beyond the normal remit of the product designer. There is little doubt that using expert researchers is the ideal approach, and if given the chance, one that should be taken. However, in reality, an invaluable resource can be established by setting up relationships with an enthusiastic and varied range of users.

### **Focus groups**

The majority of user research as practiced by designers will be qualitative, and there are both positive and negative factors associated with using focus groups. On the positive side, a focus group provides the opportunity for in-depth discussion and exploration of the issues. On the other hand, strong individuals can dominate small groups and a ‘sheep’ mentality can develop. Further, analysis of the information gathered in a focus group needs to be carried out with some care, as it is easy to interpret findings that are more akin to what one wants to hear, rather than what has actually been said or displayed. Qualitative focus groups should be kept small, with the numbers limited to around five, with the number of groups, range of ages and abilities dependent on time and financial considerations as well as the topic being explored.

Experience has suggested that meeting the same group three times would provide an optimum scenario. The first group would be focused on analysis, using existing benchmark products as stimulus and exploring the problems that are associated with them. This should raise many issues that will serve to provide the criteria for the briefing document. The second group might be implemented once some concepts had been generated; these might be in the form of loose prototypes, forms, schematic drawings and sketches.

Providing stimulus in a form that can be interacted with will be a benefit at this stage. This second stage will help steer the concepts towards a final, and hopefully optimum solution. The third group can then concentrate on solution evaluation. If this final proposed solution is in an interactive form, perhaps as an appearance model or working prototype, of whatever type, then this is likely to provide a more valuable form of feedback than a purely static, non-interactive representation.



Working with users.

Other practical considerations include allowing enough time for the group to be recruited, enough time to generate a topic guide that will elicit the correct information, and enough time to carry out and analyse the result of the group. Further, financial provision should be made to pay travel expenses, for a venue, for refreshments and make individual payments.

### The importance of users



15.2 BT Big Button phone.

It is important that the interaction of users adds to, rather than interrupts the flow of the design process. Their involvement should be seen as intrinsic, rather than something that has to be done to satisfy the requirements of the project. It is accepted that it will be a rare project that will involve users at all these three stages, however, it is believed that the earlier the user involvement, the more effective its influence will be. The key objective of involving users is in empathising with their needs and desires. We must understand the context and environment within which a product is to be used, how the user interacts with that environment and therefore the products within it. This ethnographic and empathic understanding of others is a vital first step on the path to effective inclusive design.

### Case Studies

There follows two case studies of Alloy projects that illustrate the practical application of inclusive design principles. The first case study, describing the design of a cordless telephone for BT, illustrates how inclusive design principles can be integrated into the design process for a mass consumer product. The second case study, Kettlesense, represents a speculative, but comprehensive inclusive design project, carried out in response to the 2001 DBA Design Challenge: Innovation through Inclusive Design.

#### Case Study 1

#### BT Communications Products: Freestyle 60

Since its inception in 1999, Alloy has designed the majority of BT's domestic products. The Alloy team has been working on BT products for over 10 years. Following on from the success of the corded 'Big Button' phone (Figure 51.2), Freestyle 60 represents a distinctive example of inclusive design in a cordless format.

## Background

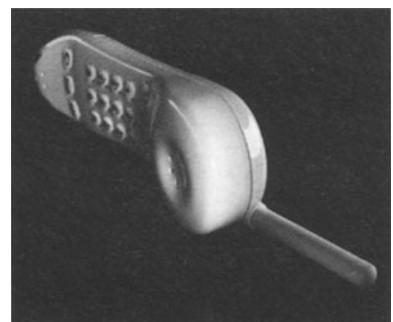
As cordless phones come down in price and become more mainstream and widely available, the barriers to purchase are reduced to issues of detail preference. Many phone users don't make the switch from corded phones to cordless simply because they don't want to compromise on keypad size or earpiece comfort. People with a preference for large buttons can be found in all age groups, but the main age group is 50+ where important personal benchmarks have been set by a lifetime of corded phone usage.

This age group is not only a fast growing market segment, it is breaking the mould of 'third age' behaviour. Belonging to the baby boom generation, they are sophisticated consumers whose attitudes were formed in the 60s, rejecting the thrift values of the post-war generation. Customers in this segment are demanding practical product attributes that deliver better human-factors performance in order to overcome deteriorating dexterity and vision. But they are also demanding that these practical attributes are incorporated in stylish aspirational products of the sort they have been buying all their lives.

The attitudes of this segment are in tune with BT's inclusive design philosophy. One of the key beliefs behind the identity of BT phones is based on the premise that design attributes compensating for loss of dexterity and sight impairment can also be very appealing to mainstream customers, especially heavy users. A large group of BT customers simply prefer larger buttons for ease of use. This belief has been confirmed on a number of products, especially the Converse range and the corded Big Button product, both of which sold to a much broader market than was originally envisaged.

## The brief

The brief was to design a new analogue cordless phone that would replace the existing Freestyle product range, which includes Freestyle 70 (Figure 15.3), the best selling phone in the UK. The design must satisfy the requirements of a wide range of users, from children to the elderly, and continue to encourage the shift from corded phones to cordless.



15.3 BT Freestyle 70

## The design approach

The overall design theme was defined as: 'Cordless mobility with corded phone comfort and practicality'. The handset design uses a keypad with a key size and pitch that has been proven in many ergonomic studies to be the optimum for corded phones. The innovation was to use this size of keypad on a compact cordless handset. Similarly, the earpiece bowl is designed to match the comfort and acoustic quality of BT's corded phones.



**15.4, 5, 6 Freestyle 60**

Handset, base station and answering machine.

The general aesthetic is inspired by the BT Product range identity, now applied in an evolutionary way on over 150 designs. The waisted curves of the plan-form have been adjusted to emphasise the large keypad and earpiece treatment. The earpiece is designed to be extra comfortable and to create an optimum acoustic bowl around the ear. The soft curved cross-section shape is designed to make the product fit more comfortably in the hand and is easier to hold by people with smaller or less dexterous hands (Figures 15.4, 5, 6).

Colour contrast has also been used to enhance usability; the main keys have white graphics on a dark background, well known to have the highest legibility. The handset talk key is in green to reflect its important role in controlling calls. The key is also marked with a handset icon in preference to words to demonstrate that the key plays a similar role to picking up and putting down the handset of a corded phone.

The same design philosophy extends to the base designs for the basic phone and the answering machine. The keys are large and located

to emphasise usability. They are placed on a simple, elegant teardrop base with a very compact footprint. The cradle design combines a spigot arrangement with a very shallow recess. This combination ensures that reliable charging contact is made even when the handset is not located precisely on the cradle. It also makes it very easy to pick up.

## Case Study 2

### Kellesense

Kellesense represents a rethinking of the domestic kettle, designed for the 2001 DBA Design Challenge: 'Innovation through inclusive design' run in conjunction with the Helen Hamlyn Research Centre at the Royal College of Art. The proposal responded to the specific theme of 'Domestic Lives', to create, "...a mainstream product, service, garment, environment, print, on-line or other communication which deliberately includes either the needs and aspirations of currently excluded groups of people..."

### Background

Being able to do everyday things is a key element to social inclusion. To respond to the design challenge, we looked to the mundane, the need to boil water, to inspire a product that would significantly improve an everyday experience for all people of all ages, able and disabled.

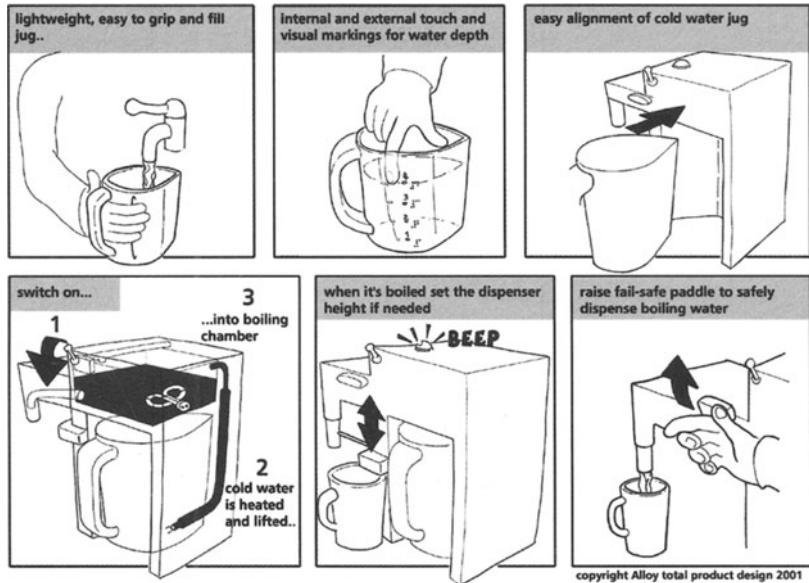
A physical impairment makes the kitchen one of the most difficult and dangerous places in the home. The Royal Society for the Prevention of Accidents (ROSPA) states that heat related incidents are in the top three categories of household accidents. Low strength, impaired vision or dexterity problems make products such as kettles difficult to use and increase the chance of a heat accident. Existing kettles vary dramatically in price, from £9 – £90 (source: Argos Catalogue, 2001), as well as in features and performance. Innovations tend towards relatively minor marketing 'gimmicks', rather than focusing on the wide variety of needs of the end user. Dedicated products such as 'kettle tippers' are relatively costly, from £12 – £20 (source: RICA Guide: Equipment for an easier life), and are inherently stigmatising.

### The brief

Our interpretation of the brief focused on the re-design of the most frequently used and dangerous of all domestic appliances, the

### 15.7 Kettlesense

Initial concept story board.



kettle. It should be designed to include the needs and aspirations of all consumers including currently excluded groups. The overriding objective, to make the simple act of boiling water more convenient, more accessible and available to all ages and groups of end users.

### Design approach

The kettle is one of the most heavily used of all domestic products, yet, the general configuration and design of the majority of kettles makes them difficult and dangerous for many people to use. Revisiting the whole concept of the kettle from first principles enabled us to develop a product that is easier to use, more accessible and highly inclusive. The project involved taking a common sense look at the issues surrounding the creation and use of boiling water in the kitchen, from all aspects, hence the name: Kettlesense.

Focus groups involving a wide range of users with different needs revealed a number of key concerns regarding existing kettles. Without doubt, the key concern was safety. Lifting or pouring boiling water was the area in which the majority of difficulties with existing kettles were being encountered. Other issues of concern included filling, switching, water levels, water quality and cable management; equally

important was the need for choice and the resentment associated with stigmatising products.

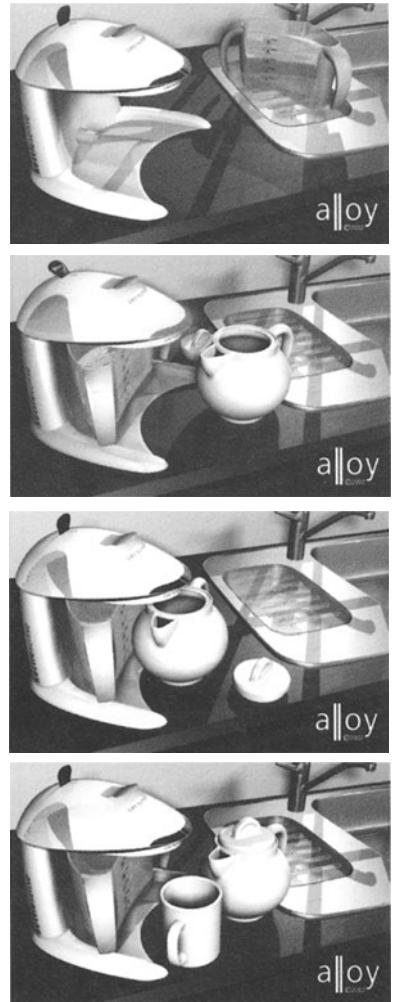
Generally, users with arthritis found the weight of existing kettles too heavy. Many of them were proved too heavy for users to lift even when empty. This weight, combined with the extra weight of water, and the difficulty of gripping and twisting against an offset centre of gravity, makes the pouring action difficult and awkward. Those with limited dexterity often found kettle lids impossible to remove and those with visual impairment found it difficult to tell where the water would pour, especially when using small containers.

With the main safety concern focusing on lifting and pouring boiling water, it was determined that the proposed solution should remove the need to do this. This immediately has the knock on effect of reducing some of the other main concerns: lifting, filling and cable management. Switching, water levels and water quality are addressed directly via specific design attributes.

The design concept (Figures 15.7 and 8) consists of two main chambers, the lower 'jug', is removable by the user for filling. It has a smaller capacity than a normal kettle and is purely a simple jug, it incorporates no electrical components, considerably reducing the weight. The jug does not have to be lifted or the contents poured, it is merely slotted into position under the upper 'boiling' chamber. The water is transferred automatically from the lower to the upper chamber, where it is boiled.

Once boiled, the user is informed using both audio and visual alerts. The water can then be dispensed via a fail-safe lever into the required vessel. As a result, the user never has to pour boiling water. Filling is limited to putting cold water into the reduced capacity jug, which never gets hot, and incorporates a tactile volume measurement for the visually impaired. Its shape is suitable for both one and two-handed use and the handles are suitable for those with limited dexterity. The switches are obvious and easy to use and there is a 180° high visibility power-light. To ensure that the chamber never boils dry an audio alert sounds if the user switches the unit on when the boil chamber is empty.

Kettlesense uses technology that is in general use in many of the current domestic appliances and would therefore retail at a competitive price. The Kettlesense concept is based on straightforward engineering



**15.8 Kettlesense**

Final concept and user scenario.

principles, but there are some innovative features to Kettlesense that required validation by making quick 'breadboard' prototypes. With the pouring nozzle set at a fixed height, it was essential that water didn't splash whether pouring into a small cup or large teapot. Experiments enabled us to establish an optimum hole diameter that would not splash whilst maintaining a satisfactory rate of flow. Concern about steam getting near the customers hands led to the trial of various profiles to determine a steam duct that captures rising steam from the vessel and safely directs it towards the rear of the machine where cool air draws it away.

## Summary

The objective of inclusive design is to satisfy the needs and desires of the broadest range of users possible, in order to do this, we need to be more aware of the needs and desires of those users, and who they are, than ever before.

In many ways, inclusive design can be seen as merely an extension of good design, encompassing all the associated requirements of functionality, ergonomics, aesthetic appeal, target markets and so on. As product designers, user centred design has always been at the heart of what we do. However, it can be seen that by widening the scope of end users we are designing for, by including more and excluding less, that the consideration of inclusive design as an integral part of product design activity makes us look much harder at the design problem, thereby increasing the chances of creating more creative, more innovative and more appropriate design solutions.

With improvements in education, exposure to the appropriate contexts, understanding of the key issues and some adaptation to the way design projects are carried out, inclusive design can become an everyday activity. Furthermore, if we are to secure our future as product designers and satisfy the demands of the most powerful consumers currently out there, then it is clearly in our best interests to do so.

## Acknowledgements

All images courtesy of Alloy Total Product Design and BT.

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## Chapter 16

# From process to pleasure

**Raymond Turner**  
British Airports Authority



There is a recognition by airport operator BAA that its business is not just about providing places for aircraft to use but is also about moving millions of people and managing their expectations. T5, Heathrow airport's new terminal, will not just be a landmark building but a role model of inclusive design and instinctive wayfinding.

By 2012 there will be twice as many people flying, which means at least twice as many people in the airport terminal building. In the next few years the equivalent of the population of China will pass through BAA's seven UK airports, which include Heathrow, Gatwick, Stansted and Southampton in the South and Glasgow, Edinburgh and Aberdeen in Scotland.

Even for the most experienced traveller the scale and complexity of the modern airport terminal makes it hard to find your way around. Add the physical impairments that result from ageing and the airport experience becomes a truly daunting prospect.

In common with most other airports around the world, BAA's terminal buildings were never designed with inclusivity as a priority. It's fair to say that they seem to have been designed by (and apparently for) young, fit and able-bodied architects. As a result BAA has had to retrofit accessibility into its older buildings and there is a practical limit to what can be done.

Space has also been a severely limiting factor. With the exception of Stansted, BAA's terminal buildings have grown exponentially but have had limited room in which to expand. Heathrow airport has always been particularly constrained for space. As a result, BAA has had to become expert at squeezing new facilities into whatever spaces happen to be available, adapting existing spaces to new purposes and shoe-horning new activities into existing areas. This inevitably makes wayfinding more difficult and has led to a reliance on signposting to make up for the shortcomings of the built environment.

The problem of wayfinding gets exaggerated the bigger the scale of the building and they don't come much bigger than T5 – the proposed new terminal for Heathrow. T5 will be the biggest terminal building in Europe, 5 times the size of the terminal at Stansted airport and, with a baggage hall 1/4 mile long, it will easily be the biggest facility that BAA has ever built.

As large as it is, even T5 will be constrained. Following the public inquiry the site shrank to within the existing Heathrow 'unofficial'

**The quality of the customer experience is becoming an increasingly important factor for competitive success**

boundary of the perimeter road. This compressed the space available for the landside amenities and resulted in a complex multi-level solution in which people will have to travel vertically as well as horizontally.

Even so, T5 remains a golden opportunity for BAA to show what it can do with a clean sheet to make a terminal building more human and manageable for all ages and abilities.

Heathrow is one of four European airports competing for long haul flights. The other three are Frankfurt, Amsterdam's Schiphol and Charles De Gaulle airport, Paris. Currently Heathrow has the lion's share of the market but it must expand yet again if it is to remain dominant. This expansion may even be key to London remaining one of the big three world centres of trade with New York and Tokyo.

When complete, this new £1.8 billion terminal will increase Heathrow's passenger capacity from approximately 50 million passengers per year to about 90 million. But creating the capacity to handle large volumes of people is not enough. The quality of the customer experience is becoming an increasingly important factor for competitive success. Put simply, the easier the airport is for people to use, the less stressful the experience and the more likely people will be willing to use it again.

The fact that BAA's aspirations for the new terminal are for it to be much more than just a big architectural statement is reflected in the T5 design vision, which is to make T5 the world's most refreshing interchange experience. This vision recognises that T5 will be more an interchange hub than a conventional terminal. Around 40% of people using the new terminal will arrive and leave by public transport (underground, Heathrow Express rail link and bus) and 45% of those who fly in will not leave the airport but will depart on another flight. Ease of connectivity was therefore always going to be a major design consideration, but BAA wants to do more than just enable people to make their onward travel connections. BAA want it to be a rewarding experience that leaves passengers feeling positively refreshed. But how can it be a refreshing experience if the terminal is a huge environment within which people suffer a string of waiting experiences and find it difficult to move around?

An additional problem that BAA has to handle is the length of time it has taken for T5 to clear the inquiry process and the length of time it will take to build. The planning application was submitted in 1993 and



Information Arch, concept for an intelligent information interface.

the building will not be open until 2007! Given that long time span it was clearly important for BAA to anticipate the social, technological and demographic changes that could impact on the design and operation of the new terminal. BAA needed to understand the forces shaping the world of the future because the airports that it builds now will still be around in 25-50 years time. If they get it wrong, they won't have the luxury of closing down while they replace buildings and runways that have become outmoded.

To help it get to grips with the likely issues, BAA ran an 'airports of the future' research programme and amongst the many key issues identified and investigated were two that dominated the thinking - the speed and likely impact of technology change and the profile of tomorrow's passenger.

Technology change could radically alter the internal layout of the terminal building. With electronic ticketing, iris scanning to establish identity and 100% of baggage automatically screened for suspect devices, you might simply arrive at the airport, drop your bags down a chute at the entrance and walk straight through to your plane. The next time you see your baggage might be in your hotel room at your destination.

The physiological profile of the average passenger of the future is already known and the new terminal will have to be designed to meet the needs of an increasing number of older but otherwise healthy travellers, as well as the 12% of the population with special needs.

Faced with these twin problems of achieving inclusivity and flexibility, BAA reacted positively to proposals from the Architecture Department and the Helen Hamlyn Research Centre at the Royal College of Art to develop inclusive design principles for use on T5. This was a unique opportunity to get some fresh input on how to design an airport terminal from the inside out, rather than from the outside in.

The input from RCA graduates was also very timely. The focus of the T5 design team had, of necessity, been on setting the overall



People of all abilities find airport terminals tiring.

architectural form for the main buildings and the infrastructure of railways, stations, car parks, road systems and interchange areas.

Within a short space of time, however, the design team would need to concentrate much more clearly on the nature of the interior spaces and resolve what this new building was going to be like to use if you were a traveller. At this point in the project BAA knew that the new terminal would be monumental in scale but had no real appreciation of the psychological impact that such a big building would have on users and the degree of difficulty they might have in finding their way through it. Although T5 was to be the focal point for the project, an objective was to get results that could also be applied to ease access across all BAA airports.

The original brief set for the two RCA graduates was not to redesign T5 but to consider the approach to designing spaces within very large buildings that would meet the needs of all types of users and be adaptable for future change. As the project got under way, however, the focus quickly became wayfinding – the ease with which everybody could find their way around such a large environment.

The study began with the graduates seeking to understand the status quo by studying the T5 building strategy and understanding the commercial and operational parameters of an airport operator. They also tested the proposition for T5 to become ‘the world’s most refreshing interchange’ against the current practice in other BAA terminals and in comparison with other airports, such Kansai in Japan, and other large-scale public buildings, such as Bluewater shopping/leisure centre in Kent.

The passengers’ view was available through BAA’s regular customer feedback surveys but the RCA graduates wanted first hand-experience of the problems that passengers face, especially at the extremes of mobility and visual impairment. User studies were therefore carried out at Heathrow Terminal 4 in collaboration with London Regional Transport, Royal National Institute for the Blind and the University of the Third Age.

A result of the early analysis and visits to Heathrow’s existing terminals was a rejection of JG Ballard’s view that ‘...terminal concourses are the ramblas and agoras of the future city’. The graduates viewed airport terminals as busy places but with a more limited *raison d'être*. They found very little at the airport for the non-traveller and,

during their initial research, reported feeling uncomfortable when they were in the terminal. Because they were not there to travel they felt they had no place. As they visited BAA's other airports in the South East they also began to think that airports should be reflective of their local context rather than be high-tech or modernist statements of an international style of airport architecture. This, coupled with the fact that the brief was not to try to redesign T5, led them to the view that they should develop a series of small-scale 'interventions', that would help to give this huge environment a more human scale. Their proposals included the creation of acoustic arches, tactile pathways, launch pads and a family of furniture.

Many of these suggested interventions, such as the idea of a launch pad, went straight to the heart of the passenger experience. When people enter a large, unfamiliar environment they pause to look around them as they search for clues to the right way ahead. To aid this orientation, the RCA team recommended a series of such launch pads distributed along the main departures concourse of T5 to provide both a sense of entry into the building, combat the vast scale of the terminal and act as an initial source of information. The simple change in vocabulary from the more functional BAA description of these areas as 'orientation spaces' to the more emotive description 'launch pad' stimulated a great deal of rethinking about the problem and made a larger scale of design solution more desirable and permissible.

The most difficult routes are those through open spaces where few directional clues are apparent and where signing is often the only way to direct and guide. The idea of tactile pathways was put forward with main routes distinctively marked in the design and arrangement of the floor surfaces. This approach is already used in some degree by BAA. For example, differences in surface colour are used to help define the extent of a circulation area, the edge of a customer route, or provide emphasis to a key destination, especially in large, open areas. Sound difference between soft or hard floor surfaces can also help to differentiate walking from seating areas and act as an aid for the partially sighted. Again, the RCA graduates went one step further in their use of these devices. In their concept of 'The Yellow Brick Road', they proposed creating major and obvious differences in floor colour to help customers locate their next destination and steer them towards it.

Their concept of the ‘audio arch’ was prompted by the experience of a regular blind traveller at T4 who described using the audio announcements in the men’s toilets as the only sure way to hear flight information announcements, as the main concourse environment was far too noisy. A series of audio arches were proposed throughout the terminal to mark the key thresholds into and through the building. As well as providing information, the orientation of these structures would also help passengers to identify their route through the airport and act as thresholds from one stage of the airport process to another. The information given would also be relevant to the location with, for example, general orientation information being given at the airport entrance arch, leading to more personalised information at a check-in arch.

The concept of the audio arch resonated with BAA because it was very aware of the potential for new technology to help communicate with people and smooth the operational flow. One of the major problems that affects the running of an airport is losing track of passengers once they have checked-in. When flights are called and a checked-in passenger fails to appear at the gate, their bags have to be off-loaded, which often means the aircraft misses its departure slot. With passengers ‘electronically tagged’, it will be possible to communicate with individuals rather than the mass. It is no longer in the realms of science fiction that your electronic airline ticket can talk to you and tell you where you ought to go and when to start to make a move. Or that an audio arch can give you a personal message when you pass through it.

As the RCA work developed, the idea of the audio arch began to broaden into the concept of an all-embracing multimedia information arch with flat screens able to display customised information. In conjunction with a personalised flight ticket or pass, the information arch could be able to record each time a passenger passed through or was within its vicinity. The personalised flight ticket could also allow passengers to retrieve information about their flight and current location within the airport.

Underpinning these relatively small-scale but nevertheless valuable spatial ‘interventions’ was a much larger design concept that offered an alternative way of reading the entire terminal – the sensory landscape. The sensory landscape is about the interior space speaking to you

and providing you with a sense of what to do and where to go. As an airport operator, BAA's focus is inevitably more process-driven and to counterbalance this the company has already begun to encourage its operational people to think in terms of managing the customer experience at the various stages of the airport process. The concept of the sensory map pitches the customer experience at a more holistic level as a series of pleasurable wayfinding elements designed to manage the scale of the building and enhance the process of moving through it.

This new sensory landscape was developed in a large architectural model in which the space was structured around four launch pads, connected by tactile pathways and with audio arches placed at intersections of the pathways. Landmarks within the environment were created by a running track, a 'He-Man' figure and swimming pool. These ideas are not as off-the-wall as may first appear. There is already a swimming pool at Changi airport and BAA's Art Programme has begun to place some very unusual works in highly prominent positions to provide 'moments of delight' or 'photo-opportunities' within their terminals.

In a sensory landscape the small interventions would break down the daunting scale of T5 into manageable spaces that flow together. Rather than a series of designed objects to be installed at the end of the building program, they were intended as key pleasurable wayfinding elements, that enhance the processes.

The quality of the thinking demonstrated in Year 1 convinced BAA that the project should go into a second year to develop, prototype, install and test the information arch at Heathrow. The decision by BAA to take one of the study's key design proposals forward was a major vote of confidence not only for the way the research associates who had tackled the project but also for the inclusive design objectives of the Helen Hamlyn Research Associates Programme as a whole.

The second year of the RCA project was focussed on the landside (pre-security) environment and, as their knowledge of the airport operational drivers and the T5 design work grew, the graduates began to link their ideas more closely to the airport processes.

Three journey landscapes were drawn – Arrivals Landscape (plane to train) Departure Landscape (car to plane) and Flight Connections Landscape (plane to plane). These were seen from the view of the user, rather than that of the airport manager, but were still closely

related to airport process. The graduates were seeking a new balance between flow, field, movement, time and diversion and proposed to focus information at the most complex and confusing hot spots, and to provide diversions where time and boredom allow. This was to be an enhancement of the airport process with a new layer of pleasure.

BAA was keen to see some of the RCA's Year 1 ideas being applied and tested in its existing terminals. It quickly became apparent, however, that it would be of limited value to shoehorn an information arch into one of the other Heathrow terminals. The space was simply not available and the user-value of the arch would also be limited by not being able to make personalised information available. Attention therefore shifted to resolving the number 1 wayfinding hotspot at Heathrow, which was long overdue for a satisfactory resolution.

A long corridor leads from Europier to the Flight Connection Centre (FCC). Part way along the route there is a small but very important left-hand turn, which leads to Terminal 2. This small left-hand turn had a very low ceiling which made it an even less significant option and passengers who should go left at this point tend to continue straight on and find themselves in Terminal 1 or in the Flight Connection Centre. The choice of whether to proceed to Terminal 1 or Terminal 2 is governed by airlines. If you arrive on a Terminal 2-based airline you needed to go to Terminal 2 to collect your bags. If you arrive with a Terminal 1-based airline you need to go to Terminal 1 to collect your bags. All connecting passengers, regardless of which airline they travelled with, have to go to the Flight Connections Centre. Many passengers were confused and continued to end up in the wrong terminal.

Design proposals were put forward that provided visual clues and 'need to know' information in advance of the junction, which was given much greater prominence through the use of colour and lighting. The proposals were however judged to be graphic solutions to what was essentially an architectural problem and were not implemented.

The problem was not resolved until year 3 of the project when a different pair of RCA graduates proposed a more fundamental restructuring of the area. Their view was that the space behaved like a left-hand turn off a main road when it needed to be more like a fork in the road where a conscious decision about direction had to be made. Their core proposal was to restructure the space using a simple



Design proposals for a notorious wayfinding problem.

louvered screen system and to lower the overall ceiling height of the corridor so that it matched the ceiling height of the left-hand turn to create a tunnelling effect. The walk up to the decision point is currently very distracting with views of the airfield and aircraft that makes the left hand turn look like a ramp down to an aircraft. The louvered panels block out the views so that passengers focus solely on the decision point, but do not block out any light from the area.

During the second year of the project an important discipline for managing the scale of a large building and promoting instinctive wayfinding was articulated. This identified three areas of contribution towards achieving a more positive passenger experience – orientation, information and comfort.

This simple categorisation is helping BAA view familiar products and actions in new ways and provides us with a simple way of assessing the contribution that a design solution makes. The information arch, for example, addresses all three issues of information, orientation and comfort (psychological rather than physical comfort), which confirms its utility. Seating, on the other hand, provides physical comfort only, which prompts questioning about how its design and installation could be exploited to contribute to orientation, perhaps in the layout of blocks of seating, or how seating could address the information need - perhaps through built-in displays.

In the third and final year of the project the underlying discipline was developed still further by redefining the airport process. BAA's breakdown of the airport process was more operationally biased with stages such as check-in, security, customs, boarding etc being identified. The RCA categorisation adopted a more passenger-action focus:

- Entrance
- Orientation
- Processing
- Punctuation
- Decision point
- Exit.

Again, the simple but significant shift in vocabulary is proving to be enough to stimulate rethinking inside BAA but the graduates have also developed a practical tool to aid BAA managers in their design decision-making. This takes the form of a database which will enable



Eventual design solution: space is physically equalised using louvres at Europier

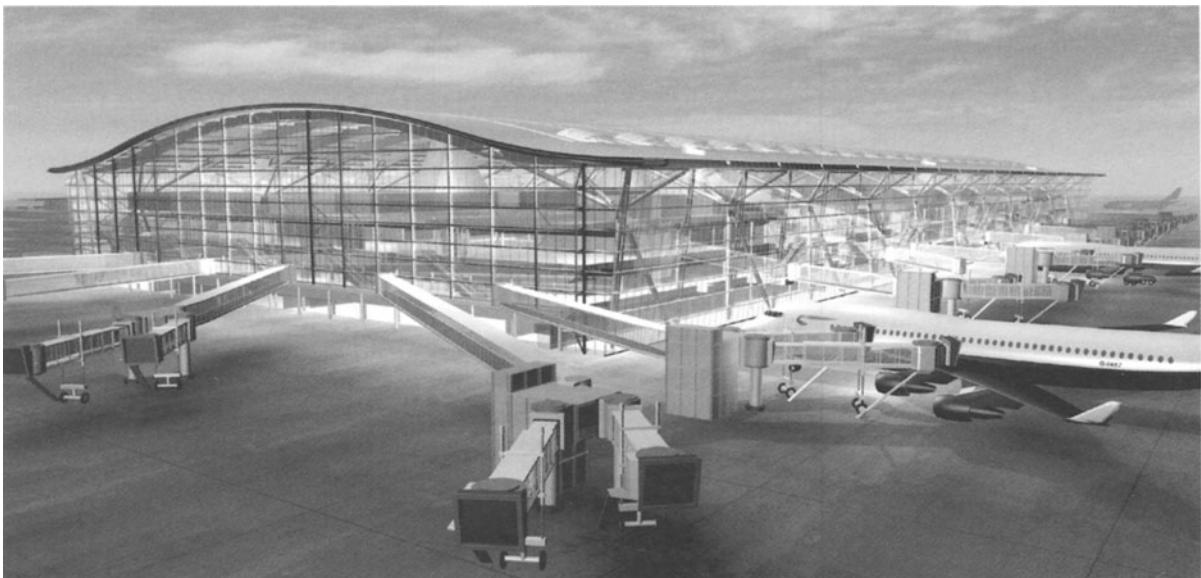
BAA managers to look at each of the above process stages and see best practice examples of approaches that deliver the most appropriate mix of information, orientation and comfort.

Have the RCA 'interventions' proved valuable? Without doubt the T5 project has and will directly benefit from their involvement. The concept of the sensory landscape, the spatial interventions, the three-pronged information, orientation and comfort discipline all now inform the T5 design team thinking. The interior design team started their work on T5 at the end of September 2002 and the RCA proposals formed part of their design brief.

In addition, BAA was handed a good design solution for a specific wayfinding problem and an electronic database of best practice solutions. But perhaps the most significant input from the project was the simple change in vocabulary. The shift from 'orientation space' to 'launch pad' and from 'managing the customer experience' to creating 'the sensory landscape' was enough to stimulate BAA to take a timely step back from the infinite amount of detail that goes with a project like T5 and take the more macro-view of how to manage the sheer scale of the new building and its other existing terminal buildings.

BAA also gained a degree of confidence from the project in the sense that the RCA graduates homed in on the customer experience, which is the key design driver for BAA. It firmly believes that its buildings are, first and foremost, for people to use. Architectural awards and plaudits come second. The RCA project also gave BAA the opportunity to look for bigger solutions to bigger problems. The idea of having a launch pad into a building stimulates a grander train of design thinking than creating an orientation space, which simply translates into creating a clear space for people to gather in front of a bank of check-in display screens.

BAA has also been spurred to think about making more use of the opportunities that already exist. For example, BAA is very much sign-driven in its approach to wayfinding and has a well thought out signing system that manages to compensate for the illogical nature of many of its large internal spaces. The RCA work helped BAA recognise that there is much more that can be done with other visual clues and with aural and tactile elements, over and above public announcements and statutory changes in surface finishes to aid the disabled.



Learning is however a two-way process and the RCA graduates gained some valuable experience from interacting with a real client. They learned a lot about the business drivers of an airport operator, many of which involve conflicting interests. For example, the primary focus of the operational side of the business is getting passengers and their baggage to and from the aircraft on time. At the same time, the retail arm, which generates major revenue for BAA is focussed on maximising the amount of time that passengers spend in the shops.

For many designers their first contact with a real live client is a rude awakening. The more complex the client and the more complex their business, the more difficult and more important it becomes to make a convincing business for their design proposals.

The RCA graduates quickly realised that the success of their project would be judged on its contribution to the business and feasibility rather than a grand or fantastical vision. Even so, and despite being aided by the buffer of a BAA Steering Group and a Working Party, they still found it harder than they imagined to move things forward. This was not due to BAA being more bureaucratic than any comparable business but lack of experience of how a large and complex organisation works and how best to manage people's high grounds, expectations and objections.

Heathrow Terminal 5, proposed exterior.

So what can users expect from T5? Will it be the refreshing interchange experience that BAA wants it to be and the role model of inclusive design? Primacy for the passenger journey has been enshrined in the T5 design brief and the building has effectively been designed from the inside out, around the passenger journey. This includes minimising the number of changes of level that people need to negotiate – which is in itself a big plus for wayfinding. The routes through the building will be very clear- both to see and in the sense of being clear of obstructions.

The primary method of vertical circulation in an airport terminal building is usually by escalator, with lifts tucked away in a corner for those with baggage trolleys or wheelchairs. At T5 BAA is reversing that order and making lifts the primary means of vertical circulation and escalators the secondary method. This means that those in wheelchairs or simply laden down with trolleys or pushchairs will not have to find alternative routes but can stay with the main flow. The lifts will be much larger than usual- so much so that they will even accommodate electric buggies that will be able to drive in one side at one level and straight out the other side at the next level.

Elements of the sensory landscape are already included in the T5 environment in the form of running streams of water that provide orientation as well as a more relaxing ambience. Waterfalls, major artworks and a series of other pleasurable visual and audible wayfinding elements are being planned to help manage the scale of the building and enhance the process of moving through it.

At the check-in area passengers won't be faced with an intimidating wall of desks but a new design of walk-through desk. This is part of BAA's plan to make the airport process smooth and seamless rather than a series of stop/start experiences.

Thanks to technology changes, security scanning will be more effective for everyone – and at the same time less intrusive. By the time that T5 opens the technology will probably be available to make the interactive information arch a viable intervention and you can expect to see it appear in some form.

However, most of the actions that will make T5 the role model for inclusive design will not be new departures such as this but will be the painstaking attention to detail and the application of existing



best practice in the form of tactile paving, access ramps, stairs with grippable handrails, wide doorways, accessible toilets etc,

Heathrow Terminal 5, proposed interior.

BAA cannot avoid long distances at its airport but it can and will avoid some of the worst excesses. For example if you are unfortunate enough to have a flight leave from gate 52 at Terminal 3, it can feel that you are walking all the way to Windsor. At T5 the maximum walking distance will be 250m. On the long routes there will be travelators but the main means of movement from the main terminal building to the satellites will be by track transit system. The journey through T5 will be just as easy in reverse for arriving passengers.

BAA has recognised that an increasingly ageing population will need more help, and are designing T5 to be buggy and wheelchair friendly. At the moment electric buggies can only take you part of the way through the airport. At T5 BAA plan to have buggies available to carry passengers that need help all the way to the aircraft and back again, through immigration and customs as well, without the need to get out.

Wheelchair users often find that they have to give up their own personally tailored chair early in their journey through the airport so that theirs can be loaded in the aircraft hold. BAA's aim is to enable wheelchair users to stay in their own chairs right up to the aircraft door. At T5, lifts are being built into the airbridges that connect the gaterooms to the planes to enable wheelchairs and baby carriages to be taken straight down to apron level for loading.

The inclusive design approach will also begin even before you get to the airport. If you have already used the Heathrow Express rail link from London Paddington you will know that the platform and train are at the same level and the train has been designed so that wheelchair users can access it at any point. There are no special toilets on board for the disabled because all the toilets are wheelchair accessible.

If you travel to an airport by bus you often find that you arrive in a less than salubrious area that doesn't feel like part of the airport and which can be hard to negotiate. That won't be the case at T5. BAA is making sure that there are no second-class experiences. For example, the car parks will not be dark and dingy environments but will be light, bright open places with wide aisles and larger than normal parking bays, so that people can more easily offload.

The terminal is being designed around a notion of a level playing field for all modes of transport. There are no arrivals, rather everyone is departing by one means or another. This is one of the strategies that the T5 design team has implemented to manage the highly complex network of travel options. BAA has recognised that if it is to succeed in its aim of being the leading airport operator, it will have to make its airports easy to use for every single person – the young and old, fit and disabled, passengers and staff. The commercial argument for doing so is clear. If you make things easy for the disabled and the old, you make things even easier for everyone else and if people find the airport easy to use, they will be willing to repeat the experience.

The doors to T5 are due to open in 2007. If BAA gets it right, it will be both exceptional and unexceptional. T5 will be a stunning landmark building of an exceptional scale. At the same time it will be unexceptional because no one will feel in the least excluded. Access and use will be easy for everyone, regardless of physical disability, mental capacity, age, ethnic background or religion. T5 will be a model of inclusive design.

## Acknowledgements

Chapter title page image: 'scene editing' in Heathrow Terminal 1 to aid orientation, Samson Adjei RCA Architecture and Interiors and Pascal Anson RCA Design Products. Thanks go to Karen Adcock, Carl Turner,

Helen Hamlyn Research Associates 2000/2001, to Samson Adjei and Pascal Anson, Helen Hamlyn Research Associates 2002, and their research partner BAA. Also to Professor Nigel Coates and John Smith of the Department of Architecture and Interiors at the RCA. Images: T5 proposal, courtesy BAA, concepts and scenarios by the Resaerch Associates.

# The global picture

In this international section, a range of contributors look at the emergence of inclusive design principles and practices across three continents – Europe, North America and the Far East.

Karin Bendixen, Roger Coleman and Päivi Tahkokallion begin this global round-up with a European perspective, looking at networks, organisations and specific projects aimed at the 800 million people in this pivotal territory of the world economy.

While inclusive design is the common title in Europe, universal design is the accepted term in Japan and North America. In the next two chapters of this section, Satoshi Kose focuses on the rising popularity of universal design in Japan and the research challenges that arise from an inclusive standpoint. James Mueller, meanwhile, explores the world of universal products in the United States, tracing their evolution into powerful instruments of market advantage.

Finally, Elaine Ostroff of the Global Design Educator's Network examines education strategies in a range of institutions around the world, concluding that the efforts of individual educators are having as much effect as systemic pilot programmes.

## Chapter 17

# A European perspective

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## The context

Shortly after the Americans with Disabilities Act was passed, John Salman, access consultant and expert on its implications, was asked to give advice at a state level across the US. As a result he visited each and every state within a six-month period, and must be one of the few people ever to do so. What surprised him was the homogeneity of American culture, the uniformity of its cities, and the dominance of major brands. In a conversation with one of the authors he remarked that it was only in rural areas, and in terms of climate and landscape, that any sense of local difference and individuality truly broke through. As an enormous and homogenous marketplace with a single currency and a legislative framework that can level the playing field on issues such as access to services and environments, the American condition is unique.

In contrast, Europe is a diverse and historic continent whose recent history has been concerned with a coming together both economically and politically, after centuries of conflict and competition, and whose future will see this process substantially extended towards the east. European unification is driven by a determination not to see war again devastate its countries, as it did twice on a massive scale in the last century, and more recently by the fall of the Iron Curtain. Unification is also driven by the imperative of competition with other large trading blocs and currencies, and the economic consequences of the collapse of communism. Together, these factors point towards a Europe where political and geographic boundaries are likely to converge.

With a total population of some 800 million people living within the traditional boundaries of the continent – west of the Ural mountains – Europeans come from diverse cultural and ethnic backgrounds, speak many languages and dialects, and live under conditions ranging from traditional rural communities to cosmopolitan and sophisticated urban centres, all with long histories and unique characters. It is this enormous and growing diversity in an historic context that makes Europe distinct, and very different from the United States. But diversity and unification are not easy bedfellows. Creating a united Europe without losing the cultural and historic richness that lie at the core of its identity, and took many centuries to evolve, is a major challenge. So too is managing the transition to stable, multi-ethnic nation states. As communities are absorbed from what were

1993 was designated  
'European Year of Older  
People'

once colonies, economic migrancy grows, and people enjoy increasing mobility within an expanding Europe.

### Social inclusion

The pressures these trends create are considerable, in a continent with a history of conflict and ethnic cleansing. The response has been for the European Union to identify social inclusion as a key goal for the community as a whole, and the local level; and to seek to combat exclusion on the grounds of both poverty and ethnicity. By extension, the concept can be applied to social exclusion resulting from age and disability, and so the European model emerges as one that focuses on participation and the celebration of difference at the group level. This is distinct from the American model, where the emphasis is on the rights of the individual. For instance, 1993 was designated 'European Year of Older People...' stressing the group rather than the individual, '...and solidarity between generations', stressing the importance of inter-community relations and social integration.

Social inclusion lies at the heart of European unification, and will shape its institutions and legislation as well as the way design is used as part of the overall goal of creating a unified society that celebrates difference and offers participation to all. It is a small step to recognise that design can and does exclude groups of people, if their needs are not catered for, and that it can equally well include such groups. To ask that design play its part in countering social exclusion is therefore a very European response to the challenges that in the USA have led to the concept of universal design. The European approach has been to think in terms of 'design for all' and 'inclusive design', which reflect concerns to integrate diverse groups of people without enforcing conformity, and suggest a degree of flexibility in how that goal is achieved, whereas universal design tends to imply that each individual should be able to access a building or service, or use a product. The ultimate aim is the same, but the approaches reflect different historic and social conditions

### Networks

Networks are a powerful mechanism for fostering understanding and collaboration between communities, and it is not surprising that the key agents of change in Europe have been networks of committed

individuals and institutions working across national boundaries. In the field of design, these networks have focused on the issues of age and disability, but have all moved away from treating those groups as separate and therefore in need of special design solutions, and towards the ideas of including the needs of such groups in the design of mainstream goods, packaging, services and environments. Most have been triggered by conferences and events that brought together people with a common interest or in the context of a specific occasion. Importantly, these networks have allowed people to shift what were previously minority interests into the mainstream, by realising that together they constituted a pan-European community with a common cause.

The European Union has played an important role in stimulating these vibrant networks through start-up funding, and through building them into the process of setting agendas for research and for political and social change. But most importantly, they have acted as a vehicle whereby committed individuals can work together and discover a collective strength that can effect change in very positive ways. There is not space in this book to deal exhaustively with the many European networks, especially those representing older and disabled citizens and users. Instead the authors have tried to give a brief overview of the focus and activities of some key networks in the field of design, research and technology development, and apologise for the many omissions such a survey entails.

**These networks have allowed people to shift what were previously minority interests into the mainstream**

## European Institute for Design and Disability (EIDD)

The European Institute for Design and Disability was launched in April 1993. The trigger was a conference organised by the Society of Designers in Ireland (SDI), which took place in Dublin in 1989. This led directly to the establishment in Ireland, of an Institute for Design and Disability (IDD). With support from the EU HORIZON programme, this group called a meeting of representatives from across Europe, who formed the core of the EIDD, and set about establishing national groupings along the lines of the IDD, which could work together as a network at the European level. The original objectives of the group were to: promote interest in design as a response to disability; to undertake studies and provide information on the relationship between design and disability; and to initiate design solutions to meet identified needs at both the national and European level.

**Our purpose is to ensure that all people, and in particular older people, can live an independent and fulfilling life; and also to ensure that they can participate fully in social and economic life**

The network is an umbrella organisation for national groups whose members include architects, product, graphic and interior designers, and professions concerned with care and rehabilitation. It has a membership in Spain, Portugal, Italy, Denmark, UK, Finland, Ireland, Belgium, The Netherlands, Norway and Sweden, and is influential in European political circles, as well as active on a project basis at the local level. In 2000, it produced four issues of a magazine 'Crisp & Clear', which was supported by DGV of the European Union, and edited by Karin Bendixen, now of the Danish Centre for Accessibility. This high quality magazine documented exemplary developments across Europe, and projects involving EIDD members, and can be accessed via the EIDD website at [www.design-for-all.org](http://www.design-for-all.org).

In line with the shift in attitudes, away from treating disabled people as different and with special needs in terms of design, and towards designing for inclusion, the EIDD has more recently made 'design for all' its core goal. This is reflected in the names of member organisations like the Dutch 'Platform: design for all', and the UK group which has renamed itself from the British Institute for Design and Disability (BIDD), to the UK Institute for Inclusive Design (UKIID).

### **Design for Ageing Network (DAN)**

The European Design for Ageing Network (DAN) was launched in July 1994. The trigger was a conference in November 1993, organised under the DesignAge programme at the Royal College of Art (RCA), as part of the 'European Year of Older People and solidarity between generations'. Over 300 representatives from 21 nations gathered at the RCA to consider the design implications of ageing populations. The three-day event focused on practical responses in fashion, product, vehicle, service and retail design, and was accompanied by an exhibition, and presentations of the results of a professional 'design challenge' organised jointly with the UK Design Business Association. As a follow-up, representatives of 14 European countries met together in Amsterdam in July for an intensive series of workshops, discussion groups and plenary sessions, during the course of which they elaborated and agreed aims, objectives and a plan of action.

"Our purpose is to ensure that all people, and in particular older people, can live an independent and fulfilling life; and also to ensure

that they can participate fully in social and economic life by:

- 1 Improving the quality of mainstream design by:
  - recognising the needs of older people as normal and not special or exceptional;
  - promoting inclusive design for all;
  - developing products, services, environments and infrastructures that also respond to the changing needs, life-styles and economic situations of older people.
- 2 Initiating research into the needs, expectations, attitudes and motivations of older people in their everyday-lives.
- 3 Sharing information and contacts to facilitate collaboration between disciplines and countries within Europe.
- 4 Encouraging industry and commerce to recognise the economic potential of products and services that improve the quality of life for all people, including older people.
- 5 Adopting this approach to also more effectively design and provide for those whose needs are not as yet addressed by mainstream design.”

(DAN newsletter no 1, October 1994)

The action plan included: research and new understandings; raising awareness; exhibitions and competitions; links with industry; building up the network; and fundraising for future activities. These activities were supported financially by the DGV unit that had organised the European Year, and a busy programme of local research and events was rapidly put in place, including a travelling exhibition which visited eight countries over a three-year period, a regular newsletter, and a website hosted by the Netherlands Design Institute.

Over the next three years membership grew to over 300, primarily from design colleges, companies and organisations, along with individual designers and people active in user and consumer research. Although EU funding for DAN came to an end in 1996/7, the network saw the establishment of active local groups in many countries and also of international special interest groups, and many of the core members contributed to a major book in German on the subject of inclusive design (Coleman, 97). Given its membership, the DAN activities were naturally practice-based, ranging from research into service design and new technologies, through packaging design and openability,

to an intensive programme in Gerontechnology. Local groups were established in the Netherlands, Belgium, Germany, the UK, and the Nordic Countries, while special interest groups worked on education; information/internet; exhibitions; working with users; services; packaging and housing. Coordinating meetings were held in London, Bremen, Copenhagen, Antwerp, Amsterdam, Milan, and Helsinki, with local events, conferences, exhibitions and seminars cementing links between members, and a special collection of over 1000 books, articles and press cuttings on design and ageing providing a background of information. This resource was created as part of the RCA library and made accessible via the DAN website, in the form of abstracts and full bibliographic reference, giving students and researchers based outside London the facility to identify specific publications, and to consult more ephemeral material at the RCA.

From 1997 onwards, activities were largely restricted to local collaborations through national groups, although major projects arose out of the work of the special interest groups in education and service design. Education activities are discussed below under the GENIE network; while the direct outcome of research into service design was a proposal to the EU ESPRIT programme for a three-year international R&D programme on 'New Media for Older people'. This resulted in PRESENCE, a collaboration involving the Royal College of Art from the UK, the Netherlands Design Institute from Holland, Human Factors Solutions and Telenor, from Norway, Domus Academy, IDEA and the Scuola Superiore S'Anna from Italy, and drawing on other members of the DAN network. The output included scenarios for new information-based services for older people, designs for new IT products and interfaces, and information for designers on user research methodologies (Coleman, Bound and Aldersey-Williams, 99). All of this developed out of intensive action research into the information and interface needs of older people in Oslo, Amsterdam and Peccioli, a small village in Tuscany, on the principals of 'designing with, not designing for' and of seeking to develop better IT solutions for all based on a deeper understanding of 'critical users'.

The PRESENCE programme (Hofmeester and de Charon de Saint Germain, 99) concluded with an international conference held in London at the Royal Geographic Society in 2000, which itself became the precursor for a biennial series of INCLUDE conferences beginning

in 2001 at the RCA, which mark the transition from design for ageing to inclusive design, and are refocusing the DAN network around the inclusive agenda.

## Gerontechnology and the GENIE network

Around the same time as the EIDD and DAN networks were beginning to come together, an international group working in the human sciences, gerontology, welfare and bio-engineering, identified the important need to ensure that future technological developments assist and support older people in achieving independence and life quality, rather than exclude or marginalise them. Their response was to establish the multi-disciplinary field of 'gerontechnology', and build an international network of researchers around it. Key protagonists were based in the Netherlands, Germany, the USA and Finland, with leadership coming from the Technical University of Eindhoven (TUE) and STAKES, the Finnish national development centre for welfare and health. A series of international conferences was established, with the first taking place in Eindhoven in 1991, and others following in Helsinki in 1996, Berlin in 1999 and Miami in 2002. An international society was established in October 1999, and the first issue of the society's journal 'Gerontechnology' was published in September 2001.

**The focus of gerontechnology is 'the sustainable ageing society'**

The focus of gerontechnology is 'the sustainable ageing society'. Achieving this depends on 'our effectiveness in creating technological environments for innovative and independent living and social participation of older persons in good health, comfort, and safety. This dual perspective, seeing technology and ageing as closely intertwined in the social context, as opposed to separate issues and fields of study, has allowed researchers and practitioners from a very wide range of disciplines to build links between their activities and studies. From gerontology to design and design education, and from the bio-sciences and longitudinal studies to information technology and smart housing, the scope for interdisciplinary collaboration has been significant, and this diversity is reflected in the contents of the society's quarterly journal.'

By playing a key role in the DAN special interest group in education, Jan Rietsma and his colleagues from TUE were able to bring together an international group to establish and provide the teaching input for the first intensive programme in gerontechnology, which took place in Liverpool and Eindhoven in 1996. A group of around 20 graduate

and postgraduate students from across Europe, with backgrounds in engineering and technology, design, gerontology, social sciences and occupational therapy attended a series of lectures and courses in the subject and developed proposals for practical technology applications to support older people. This was supported by the EU ERASMUS programme, and led directly to the establishment of the GENIE educational network, also funded by the EU, which developed educational resources to support the uptake of gerontechnology across a range of academic disciplines. The network brought together universities and other educational institutions from Finland, The Netherlands, UK, France, Belgium, Germany, Italy, Ireland, and Czechoslovakia.

### National networks

National activities have also led to the establishment of active networks. For example, in the UK, the Department of Trade and Industry (DTI) initiated a major exercise in setting future research directions on the basis of UK economic and social needs. Initially entitled 'Technology Foresight' and later simply Foresight, this programme established expert panels in a range of specific disciplines, with cross-disciplinary panels looking at more wide-ranging issues like population ageing. The population ageing panel made recommendations ranging from design to healthcare, pensions and IT, among others, which helped to frame relevant research agendas. In particular, the interdisciplinary Extend Quality Life (EQUAL) programme. To date, the Engineering and Physical Sciences Research Council (EPSRC) has funded a series of research calls with an emphasis on inclusive design, and also provided support the establishment of a network of researchers in related fields. This network has served to give that research community an identity and presence that it would otherwise have lacked, leading to the establishment of one-off seminars and conferences and biennial events in Cambridge and London.

Overall, the picture in Europe is one of great diversity in local and international activities driven by networks of researchers, educators, practitioners, older and disabled citizens, and campaigning organisations. Although each of these communities has its own particular character and special interests, there is significant overlap

between them, which has created a vibrant community responding to key issues of unification and social change at the European level.

### The role of the European Commission

The European Commission, the executive arm of the EU, has played an important part in many of these developments, by planning for and investing in research and development, and through the mechanism of European days and years devoted to key issues. It has also funded many networks and other initiatives during their start-up phases, and through legislation, directives, standards and other guidance established a framework for co-ordinated action at a national level.

### Research and development

In Europe, R&D has been driven by a rolling series of 'research frameworks' encouraging international collaboration and the exploration of key themes across national boundaries. In relation to older and disabled people, there has been a strong shift in emphasis from AT or assistive technology devices and special needs design, which often proved expensive and inefficient, and did not lead to increased independence and social integration, to ensuring that mainstream products and services are accessible to as broad a range of users as possible (Ballabio, 98). The key programme in this field is the TIDE initiative (Technology for the Integration of Disabled and Elderly people), which has been a feature of successive R&D frameworks over the past 10 years and more. The concept of 'Design for All' evolved over the course of this programme, and has been taken on as a core concept in subsequent EU initiative in the field of IT or information technology.

The TIDE initiative began in 1990 with a market survey of AT in Europe, where the market was deeply fragmented by very different national mechanisms for the production, distribution and financing of both products and R&D. Preliminary work had come out of the COST initiative (Co-Operation in the field of Scientific and Technical research) which, through project 219, had addressed the issue of 'Future Telecommunications and Tele-Informatics Facilities for disabled people'. Key messages from this work were that the principle of 'access for all' should apply to future IT applications, and that older and insofar as possible, disabled people should not be isolated and treated as special cases requiring special equipment and services.

In a short space of time, thinking in Europe had shifted in an important way ... to regarding older and disabled people as part of the continuum of European citizens

In 1993, the TIDE programme entered a 'bridge' phase, where the intention was to stimulate the creation of a single market in assistive technology, to better serve older and disabled people. During the course of this phase, further evidence emerged that the needs of such people were not considered in the design of mainstream household goods and services, and it became clear that it was not advisable to continue with developing AT devices to compensate for inappropriate mainstream design. At the same time, ideas about inclusive design and design for all were beginning to emerge from the work of the TIDE projects and from the work of the embryo DAN and EIDD networks. These ideas were integrated into the core purpose of the third phase of the TIDE programme in 1994, which defined 'design for all' as a principle which aims to 'encourage the design of products and services in such a way that they become accessible to and usable by as large a grouping of users as feasible, including disabled and older persons'. More recently a range of consultation processes, including reports from, for example, the expert group on Technology and Ageing (ETAN), has resulted in design for all being adopted as a key, multidisciplinary and cross sector aspect of EC-funded R&D programmes, and placed at the core of new developments like the Europe initiative, which is laying the foundations for the pan-European information society.

In a short space of time, thinking in Europe had shifted in an important way, from talking about 'the elderly and disabled' as if they constituted a different species with special needs requiring special design, to regarding older and disabled people as part of the continuum of European citizens, who should be integrated through better design and provision of mainstream products and services. Although there remains a significant gap between the rhetoric and the actual provision of appropriate goods and services, a significant and growing number of European manufacturers and designers have been engaged with these programmes and there is good reason to see that experience contributing to European competitiveness and beginning to bridge the gap between the aspirations embodied in the ideas of inclusive design and design for all, and the reality of everyday life in Europe.

### European years

While the framing and funding of new directions in R&D is an important activity, it does not necessarily fire public interest or engage

the general public in the way that European years and days do. This mechanism is very effective in building the sort of cross-community activity and networks that are central to the European project. Just as research funding has stimulated the growth of international collaboration, and built strong networks across a wide range of disciplines, European years foster the sort of cross disciplinary contacts and communities that can advance the interests of older and disabled Europeans. 1993 was designated 'European year of older people and solidarity between generations', and resulted in a raft of local and international initiatives taking place across the length and breadth of Europe. Many of these were organised by and for older people, strengthening national initiatives like the University of the Third Age (U3A) in the UK, and extending international contacts through organisations like EurolinkAge, a Brussels-based 'network of networks', which, true to its name, acted as a key link between the many groups and initiatives that made 1993 a resounding success.

When the year was in its planning stages, the dominant issues were pensions, on the one hand, and the likely escalation of welfare costs on the other. Individuals and campaigning organisations saw the substantive issue as 'how will growing numbers of older people maintain a sufficient income into old age?' while at the Governmental level concern was focused on the consequential costs of significant rises in pan-European longevity. While these two positions were clearly opposed, there was little discussion of possible areas of convergence, like the almost universal desire among older people for an independent and an active life, where improvements in life quality could help contain welfare and healthcare costs. As a consequence, in the planning stages, design was not seen as having a significant contribution to make. By the end of 1993, this situation had been significantly reversed. Design was firmly on the agenda, and increasingly seen as key to creating an age-friendly Europe. An additional benefit lay in the potential to increase the competitiveness of European industry by fostering an understanding of the design implications of ageing populations, and the market implications of the radical shift in age profile that Europe was undergoing.

As a result of the activities of the Design for Ageing Network, the EIDD and the TIDE programme, opinions and expectations shifted significantly during 1993. The need for more inclusive approaches to

**Design was firmly on the agenda, and increasingly seen as key to creating an age-friendly Europe**

design was recognised and influenced R&D funding, while best practice design exemplars were featured in popular and professional press.

Much of this work came to a climax in November 1993 at the Royal College of Art, where cutting edge work from Europe, North America and Australia was on display. A professional design challenge was organised with the UK Design Business Association, the results which were presented in a multi-media display, alongside an international exhibition of student and professional work.

Ten years later, 2003 has been designated European Year of Disabled People, and presents the community with a similar opportunity to showcase the potential of inclusive design to deliver not a two-tier Europe, but a fully integrated society for the future. It also provides an opportunity to reflect on the progress made over the previous ten years and identify the barriers to change that remain to be overcome.

### Design practice case studies Tate Modern and the London Eye

In the UK, lottery based grants and other state funding for the arts are provided on the express condition that access for all is placed at the core of the design, as exemplified by one of the most recent additions to London's national galleries, Tate Modern, which is housed in the massive shell of the Bankside Power Station. The Thames-side power station has been transformed by Swiss architects Herzog & de Meuron into a dramatic home for the UK national collection of international modern art.

The former turbine hall, running the entire length of the building, has been used to create a breathtaking and highly accessible entrance to the gallery. An 85-metre ramp leads ambulant visitors, wheelchair users and skateboarders alike into the heart of the building, while a staircase and hand railing offers an alternative route. From there, visitors are swept up by escalator and lift, to shop, auditorium, and three levels of galleries, and a stunning roof-top cafe offering panoramic views across London.

Another new London feature, the Millennium Wheel or London Eye, is equally accessible. Approached from the South Embankment by either ramp or stairs, the Eye is immediately accessible to wheelchair users through wide doors and a level entry. The wheel may be stopped if necessary to facilitate access, and once on board, passengers can



The London Eye and the Turbine Hall at Tate Modern.

move freely around the capsules, which are kept level by an automatic stability system. In the middle of each capsule is a wooden bench allowing people to rest and take in the breathtaking views. Designed by architects David Marks and Julia Barfield for British Airways, the London Eye marks one end of a new pedestrian walkway running the length of the south bank of the Thames, from Westminster to the Tate Modern.

### The Urban Bus

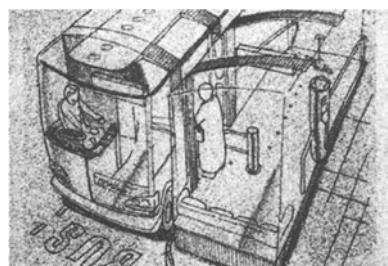
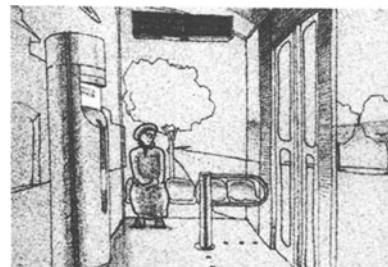
In 1993, the UK Design Business Association and DesignAge, the Royal College of Art's action research programme into design and ageing, issued a challenge to the design industry. The theme 'Designing for our Future Selves' offered designers an opportunity to contribute towards the aims of the European Year, and sponsorship from Apple Computers made it possible to present animated scenarios and design concepts to the public. As their winning entry, the London office of the international design company IDEO explored the design of a future bus system for London, including bus shelters, bus interiors and ticket service points. The aim of the design was a more effective and enjoyable travelling experience for all ages, cultures, and occupations, providing comfortable, quality-time travel and easy-to-use ticketing and information.

The bus shelter is enclosed, with seats, large type information display. Accessed by steps or a ramp, the shelter is at the same level as the bus, so passengers can walk or wheel themselves straight in. Inside the bus there is mix of seating and standing room, and information about the bus journey. Ease-of-use features help passengers manage kids, shopping and so on, including a bus card, with convenient recharge points, easy to use machines, service help from the driver and generous but secure space for bags and pushchair.

Locating a bus stop is easy because of the big, bright signs. Stops have integral ticket machines, with payment by coin, note or credit card. The instructions are clear and simple, and the sequence of operations is logical, and the ticket has a route map printed on it so passengers, and in particular tourists, can check their progress and spot famous landmarks.

### The Copenhagen Metro

In Copenhagen, new Metro stations and rolling stock have been designed to deliver transport and mobility to all people, and the same



Scenarios by IDEO for an age and ability friendly Urban Bus, 1993.



Copenhagen Metro carriages are open and accessible.

principles are being applied as the Metro system is extended to provide the transport backbone for Oerestad, a new, self-sufficient satellite of Copenhagen. Oerestad will be developed over the next 30 years on the successful UK 'New Town' model of the 1950s. In embarking on these major developments, a clear commitment has been made to creating a transport system that works for people of all ages and abilities.

This has been achieved through a close co-operation between designers, engineers, architects and importantly, users. The design process began with user consultation, and ended with user-validation and subsequent modification of final designs. Out of this process came technical specifications which were embodied in final proposals by leading Italian transportation designers, Giugiaro Design of Turin. The challenge was to accommodate the wide range of needs identified through user testing into a seamless design that married modern detailing with a high level of functionality. The result is elegant and accessible, and sets a standard for other cities to follow.

A similar approach has been taken to station design, where the architects focused on the needs of parents with double prams when setting dimensional standards for doorways and the interface between lifts and platforms. By convention, such dimensions are based on the needs of wheelchair users, and do not necessarily accommodate other potential passengers. By identifying pram-pushing parents as 'critical users', the architects have ensured maximal accessibility for all. Other issues such as lighting, signage, wayfinding and the simplicity of layout and design were central to the overall concept, which is being applied to both the refurbishment of existing stations, and the development of new stations and the extension of the Metro system for the new town of Oerestad.

### Barcelona – an accessible city

In 1996, the city of Barcelona embarked on an ambitious plan to make the city fully accessible. Step one was an accessibility audit of the city's streets and alleyways, public transport and public buildings. The audit was carried out by accessibility consortium CRID (Consorci de Recursos I Documentació per a l'Autonomia Personal) with a staff of fifty, including architects, engineers, ergonomists and other specialists. The consortium reported back in July 1996, to reveal that 55% of roads



Kerb-free street crossings with visual and tactile markings.

and streets were accessible, along with 28% of public buildings, 27% of bus stops and only 8% of underground stations.

The response was a decision in December 1996 to undertake a ten-year programme, budgeted at 9.1 billion pesetas or 55 million Euros. Making all of Barcelona's 112 underground stations accessible by 2006 could add a further 160 million Euros to the bill, so this is no light undertaking. However, the Catalan railway provider FGC, which carries over 47 million passengers a year is making good progress towards full accessibility by 2008, with well over half of its 70 stations fully accessible.

Over half of Barcelona's buses are now of a low-floor, kneeling design, making them wheelchair accessible and offering step-free access to all who need it, while a new pedestrian crossing design is being implemented to bring all street crossing up to a high standard of accessibility and safety. All the city's beaches have wooden paths, and accessible showers and toilets are being installed as part of the ten-year initiative.

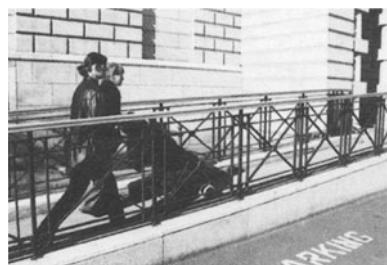
## The National Gallery of Ireland

The management of the National Gallery of Ireland, Dublin, adopted a far-reaching access policy 1995. Under this initiative, the management and staff of the gallery have worked hard to make the collection accessible to all. Not just in terms of physical access to the building, but also by offering conceptual, intellectual and multisensory access, as a response to article 27 of the UN Universal Declaration of Human Rights – the right to participate in the cultural life of the community.

Under its access policy, the gallery has introduced new lifts and other physical access features along with tactile pictures, guided tours, lecture theatre and multimedia unit with induction loops and appropriate staff training. The process began with a consultation exercise and questionnaires, followed by awareness training and an audit of the status quo at the start of the process, and the result is a fine example of what can be achieved in the context of an historic building.

## The London Black Cab

One immediate consequence of the passing of the UK Disability Discrimination Act (DDA), was that it meant that by 2001, all London



Ramped entry is easy for prams as well as wheelchairs.



Integral child seat in the new TX11.

taxis would have to be accessible. That was a huge challenge to the manufacturers, London Taxis International, but one that was met with the launch of the TX1 in 1997. Since then a second version, the TX11, is in production. The design brings the famous London 'Black Cab' up to date, both in terms of styling, driver benefits and passenger benefits. In particular, the new design is accessible to both hand driven and powered wheelchairs, boasts a swing out seat, with convenient handles, an integral child seat, and induction loop for communicating with the driver. The high-visibility safety handles and other colour-cues for people with low vision have become a feature of the design, and are integrated seamlessly into a very friendly and approachable package which really does offer access and mobility for all.

### Ergonomi Design Gruppen

In Bromma, Sweden, Ergonomi Design Gruppen has set the highest standards for combining user functionality with aesthetics. Industrial designers Maria Benktzon and Sven-Eric Juhlin work primarily on the design of tools and products to counter disability. The end user is of central importance to their work, but they are also clear that a product which improves functionality and can be used by everyone, establishes a larger market than the traditional adaptive product. This focus on a 'broader average' leads naturally to more inclusive design and results in a product better suited to the majority of people, and allows the company to undertake a very wide range of projects using the same methodology. This means that methods, techniques and specialised knowledge gained in one area can be transferred to the other, and that each product is developed to the same exacting standards.

For example, building on experience gained in developing cutlery for people with severe arthritis and other dexterity impairments, Benktzon and Juhlin applied similar methods to the development of a new coffee pot and other items for Scandinavian Airways (SAS). The new pot was designed to reduce physical strain among cabin staff, and to improve aesthetics. In-flight tests were conducted with three different prototypes to ensure functionality in the working environment. Balance and hand position were improved, dramatically reducing weight and shifting the centre of gravity to reduce strain on the wrist and hand and minimise the effort needed to carry the pot and pour out a cup of coffee. The combination of lightweight materials,



The SAS coffee pot, a range of prototypes shows how the final design evolved from an iterative process of user testing.

ergonomic function and elegant styling, have made this a successful product for both staff and company.

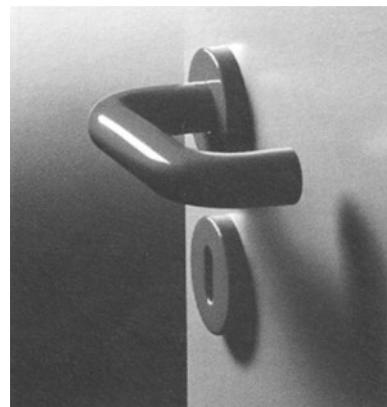
A very similar procedure was followed in the design and development of the Ergo range of professional tools for Sanvik/Bahco. By conducting thorough preliminary studies before the design process itself started, the designers created a range of professional tools that not only work superbly, but reduce the physical stress on people who use them in their daily work. New concepts, skilful use of materials and subtle detailing have produced original designs that have significantly increased sales, and made mainstream products more accessible.

## HEWI – consultation and communication

A rapidly growing number of people face not only a shortage of supportive equipment in their flats and houses, but also a lack of simple, barrier-free measures in the outside world – lifts in housing estates, stepless access to museums and cafes – which prevents their integration into functioning social networks. Add-ons, like support handles in the bathroom, cannot solve this problem alone; for industry as a whole it means taking a holistic view of the subject, which is what German architectural fittings manufacturer HEWI (Heinrich Wilke GmbH) has worked hard to achieve.

At a practical level, this meant ensuring that their entire range – which includes door handles, handrails, banisters, coat racks and house number plates – really does work well for people of all ages and abilities. The next step was to supplement traditional advertising with more practical information about how the products can be used as part of a barrier-free strategy. In particular, HEWI publishes illustrated brochures for architects, builders and planners, which have been produced in close co-operation with potential users, carers, and professional specialists.

The company also embarked on a new communication policy (Coleman 97, 132–9) built around an open-ended dialogue with its immediate customers – architects and building managers – and the end users of these products and environments. This strategy was effectively launched with an international conference – The HEWI Forum on barrier free living – which attracted nearly 400 people to Arolsen, home of HEWI, in September 1996. The proceedings of the forum have been summarised in a publication that reflects the full range



A lever landle from the HEWI range, top, and delegates at the HEWI forum on barrier-free living.

of opinions and experiences – the anger, frustration and hope – as well as future visions and possible solutions (HEWI GmbH, 97). The company's aim was to not manipulate the market, but to understand and respond to the needs and aspirations of the people who use its products.

### Marjala – a city for All

In Finland, a country which has taken a very positive approach to the issues of ageing and ability, the concept of barrier-free design has been applied on an ambitious scale as both an exemplar and a test site for developing communities which can harness the resources of the people who live there to create a potential 'City-for-all'. Starting with a nationwide architectural competition in 1990, a new, residential suburb, Marjala, has been built in the city of Joensuu, north-east of Helsinki.

A special set of barrier-free building regulations was developed for the site, requiring that all homes, shared facilities and connecting routes be designed to allow complete access and mobility, both inside and outside. Careful use of colours and materials provides visual clues for orientation, benches, handrails, and balustrading offer security, and bollards decorated with raised designs tell people where they are: Talvipäiväkatu is the street of the snowflake. There is a wide range of property types available, and different forms of occupancy and tenancy are catered for, making it possible for people with different incomes and family situations to live there together in security.

The overall intention is to provide housing where people of all ages and abilities are able to move about independently and take full control of their own lives. This is made possible through a combination of sensitive architectural design and planning, in conjunction with a new approach to service delivery centred on a 'telematic' network, accessed from home, by computer, and from the Marjala Multiservice Centre. Established in 1993, the Multiservice Channel and Centre together link all service providers, both public and private, in one network, allowing residents to seek expert advice, communicate with one another, suggest new services and participate in local decision-making.



Tactile bollard on Talvipäiväkatu,  
Snowflake Street, Marjala.

## Acknowledgements

Chapter title image: street market scene, Souillac, France, Roger Coleman. Other images: London Eye, Tate Modern, Barcelona, Irish National Gallery, Karin Bendixen; TX11, London Taxis International; Copenhagen Metro, The Oerestad Development Corporation ; HEWI handle and conference, HEWI GmbH: SAS coffee pot, Ergonomi Design Gruppen and SAS.

## Further reading

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- INCLUDE 2001** at [www.hhrc.rca.ac.uk/events/include/](http://www.hhrc.rca.ac.uk/events/include/)
- London Taxis** at [www.London-taxis.co.uk](http://www.London-taxis.co.uk)

# Chapter 18

## The Japanese experience

Satoshi Kose

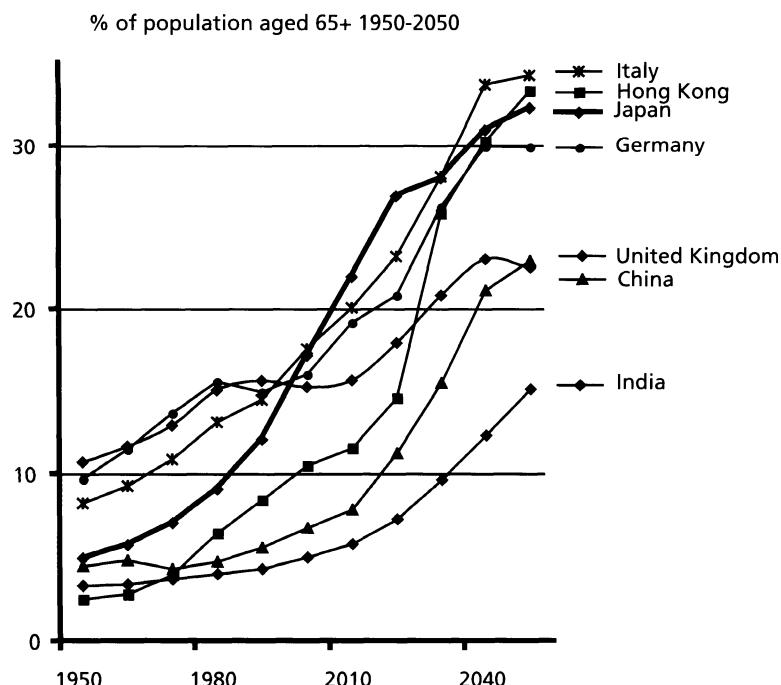
Building Research Institute, Japan



This chapter discusses how the concept of universal design gained popularity in Japan, with some references to research. It was not because the civil rights of people with disabilities were acknowledged, but because everyone had to accept the fact that ageing is one's almost unavoidable future. Preparing for one's own ageing through universal design seemed the most feasible way. Japan's rapid ageing has overridden almost all countries by now. The proportion aged 65 and over has reached more than 18% and still growing. During the past fifteen years, as population ageing progressed, design concepts have gradually shifted from special solutions for special people to universal solutions, with housing design taking the lead. Examples are given, from home modification, to ball point pens, to accessible transportation. Most of such implementation is driven by economic incentives.

## Background

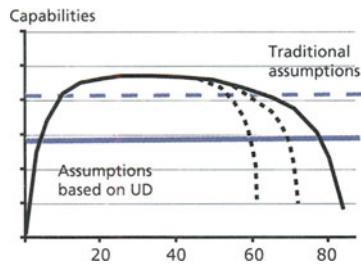
It was fairly recently that population ageing emerged as one of the biggest problems in some countries. Figure 18.1 shows 65 plus



18.1 Asia and Europe  
65+ population trends.

population trends for selected countries. There is a marked difference in the shape of the growth line between Asian countries and European ones. The latter grew and will grow very slowly while the former are destined to grow quite rapidly. A country is described as ageing when it crosses the 7% line, and as aged when it passes 14%. While it took 70 or more years for European populations move from 7% to 14%, and some had already reached 10% in 1950, for many Asian countries, the same shift is expected to take as little as 25 to 30 years. Japan crossed the 14% line in 1994, Hong Kong and Singapore will cross it around 2020, followed by China in 2030. The only exception we notice in the figure is India, where the 65+ population will reach 15% in 2050. Please note, however, that this is almost the same level of ageing as many European countries experienced at the turn of the century.

Historically we have wished to live long, so what is wrong with growing old? One crucial issue we tend to forget is that our capability deteriorates as we grow older. Capacity deterioration is slow but steady as Figure 18.2 suggests in a schematic manner. The rate of deterioration differs between various functions, and the difference between individuals is large. However, such deterioration is sure to affect our everyday activities. How can we solve the problems?



**18.2 Capability change with age**  
Schematic diagramme.

### The concept of universal design

The idea of designing for everybody emerged in recent years. One may argue that 'design for all' should be the basic assumption of the design profession, and everything should have been designed with that idea in mind. Unfortunately, the typical user that designers think of is no longer representative because of the change of population structure, and also because of the changing nature of the social system. In most cases, designers have been told to cope with the design needs of senior citizens and people with disabilities as a separate issue. However, with the dramatic rise in the number of older people, traditional ideas of barrier-free design, or special-needs design are no longer valid. It is good design that older people want, not special design. Senior citizens do not change their status suddenly when they reach the age of 65. They are as healthy and active as they were the day before. Besides, to get older and be counted as a senior will be an almost inevitable tomorrow for everybody.

## Essential requirements of good design

What are the conditions that must be met for design to be acceptable by all? Six requirements can be pointed out as essential: Safety; accessibility; usability; affordability; sustainability; and aesthetics. The first three are common to barrier-free design, but affordability – value for money – is essential in universal design.

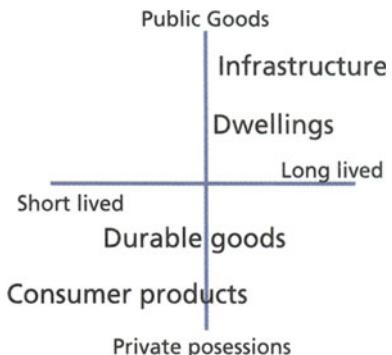
## Who pays, and how long will it last?

We all agree that we are prepared to pay the necessary cost if the benefit is worth the money. However, as the focus of design goes up from consumer products to housing, building, and to urban infrastructure, there will be a shift in terms of who bears the expense. Consumer goods are bought by individuals, but more expensive ones tend to be financed by society as a whole. There is also a tendency for designs to last longer as they move from bottom left to upper right in Figure 18.3.

Ball point pens and mobile phones are the examples of consumer products where people benefit by having a range of design varieties. Ball point pens can be very expensive, although their basic function is to enable writing without undue burden to the users. The first generation ball point pen resembled a hexagonal section shaped pencil, but more recently the grip design has changed significantly, and we can now buy a well-designed ball point pen for less than a Euro (Photo 18.4).

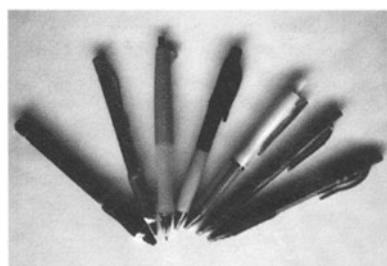
Mobile phones have become an essential part of modern life. However, user-friendly mobile phones are difficult to find. This is because they are targeted to younger users who spend a lot of money on them. The prime concern of the designers is to appeal to young users, and as a consequence the over-35s are disregarded. Unfortunately, it is around that age that we begin to develop presbyopia, which makes it hard to read small displays and characters.

For some three years, there was only one age-friendly model in Japan, available from NTT DoCoMo. It had a sliding lid, which covered the buttons, revealing only three for pre-registered short-cut dialing. Recently a second generation version was introduced, which is far more sophisticated, integrating most advanced functions in a better way, and including quick e-mailing, and a simple i-mode, web browser. Many age-friendly features are claimed to be incorporated, but time limitation did not allow for a complete redesign of the micro chip, and choice is



### 18.3 Who pays?

The relationship between durability and where costs fall – on the public or private purse.



### 18.4 Consumer choice

Ballpoint pens.



Tactile paving can help those with low vision.



Escalators can accommodate wheelchairs by making 3 steps flat.



Lifts can give step-free access to platforms, but a keyholder has to be called to unlock the lift.

still quite limited because only one model is currently available. All the rest are designed to satisfy the needs of young healthy people only.

However, the quick e-mailing facility has turned out to be a blessing for people with hearing disabilities because non-verbal communication became possible.

### Town planning and infrastructure

Places where people work and live must be made accessible and usable to enable people to enjoy their lives. Younger people commute without experiencing undue difficulties, but when they retire they do not want to move home, even if travelling becomes more difficult. That will be possible when the physical environment is designed to accommodate everybody, from children to seniors, men and women, regardless of age or ability. Consequently, the focus or starting point has to be housing design, particularly for older people, then accessible buildings and facilities, and then transportation between these crucial places.

It was with this goal in mind that the Japanese 'Draft dwelling design guidelines for the ageing society' (not for the aged) were introduced in 1992 (Kose, 1996; 1997; 2001a). After that came the Accessible and Usable Buildings Law of 1994, and finally the Accessible Transportation Law of 2000. As the debate progressed, the emphasis shifted towards thinking about how to make environments age or senior-friendly, rather than just accessible to disabled people.

Two important developments within the housing design guidelines were the introduction of level floor bathrooms, i.e. with no change of level between dry and wet areas (Kose, 1998) and bidet toilets. With their design excellence and affordability these become commonplace and are found everywhere in Japan. From mid to high end multi-family dwelling units, bathrooms have level floors, while bidet toilets are to be found in about half of all Japanese dwellings, and also in office buildings, demonstrating the responsiveness of employers and owners to the needs and expectations of workers.

The formal, lengthy titles of the accessibility laws refer to seniors before disabled people, the assumption being that they would be more readily accepted as addressing everybody's future. Importantly, nobody would wish to be dependent on help and assistance, when a well designed physical environment would make it possible for them live independently. The basis for this thinking is illustrated in Figure 18.4,

which is similar to the Ergonomi Design Gruppen concept of the User Pyramid.

Ideally, everything should be designed with universal design in mind, but to accommodate more extreme capabilities, other features must be integrated into designs to make them accessible and usable, especially where the existing infrastructure is under consideration. We have to admit that it is not currently possible to ensure that everything is usable under any conditions and by anybody, regardless of their capabilities. In some cases, add-ons would work best, in other cases replacement may be better.

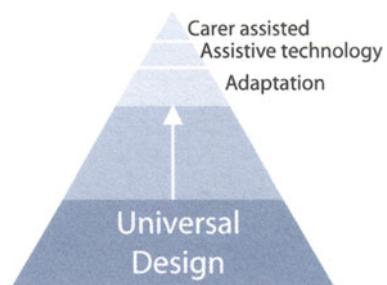
It goes without saying that public transportation must be made accessible to everybody. After all, the users pay the fare, and companies that operate transport services usually have some form of exclusive rights or monopoly. During the transitional phase, not all stations may be accessible and usable, but if that situation continues, where it does, people will avoid those stations, and economic downturn around them is sure to follow.

## Critical examination and proposals for improvement

These problems are everywhere, but will be overwhelming in the big cities because space is limited and costs will be more higher. What Tokyo Metropolis intends to do will be a good example (The Tokyo Plan, 2000). The Japanese capital city is home to around 12 million people, about one tenth of population, and has been a city dominated by younger generations for many years. Students came to study at the universities, then many found work in Tokyo and settled within the Kanto area, which was one of the engines of rapid and steady growth of the Japanese economy. However, with the maturing of the Japanese population, economic growth has almost stopped. The commuter towns that grew up on the outskirts of Tokyo, once full of young people, are steadily growing older. Inner city problems are also evident. It is expected that the total population of Tokyo will start to decline within a few years. In the face of these new realities, it is vital to change the whole system into one where older people play an important role. The starting point has to be the provision of accessible environments that will enable seniors to work, move around, and enjoy life. Such radical change is sure to be a lengthy and costly process, but without such efforts, decline is inevitable.



Not all platforms are accessible, so the guard helps negotiate the 50cm drop to the platform.



18.5 The scope of universal design.



The author tests a shopping buggy in Tokyo.

## Future research challenges

Lucky enough, the current trend is to hand over the final decision of policy goals to local governments from the central. The process may need much effort and will be time consuming, but with various kinds of incentives and regulatory measures, Tokyo will be able to reach its intended target. After all, it is the will of the residents in that area that will decide what must be accomplished. If the taxpayers will not get their fair share, they are sure to move away once they reached a stage when they do not have to live in Tokyo (not even in Japan).

## Acknowledgements

All images courtesy the author.

## Further reading

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## Timeline

### Major legislation, guidelines, and events related to universal design and assistive technology in Japan:

- 1949** Law on welfare of the disabled
- 1970** Law on basic measures for the disabled
- 1974** Machida City implemented guidelines for barrier-free design.  
Other local governments followed.
- 1987** Law on promotion of employment of the disabled
- 1987** Project by the Building Research Institute of the Ministry of Construction on Designing for the Ageing Society started (until March 1992).
- 1989** 'Golden Plan' ten year strategy of welfare measures for the aged
- 1990** Kanagawa Prefecture implemented Building Ordinance for Barrier-Free Design, first in Japan.
- 1991** Draft Design Guidelines for Public Multifamily Housing toward the Ageing Society completed, to be utilized by local governments. Tokyo metropolitan government started their implementation. (Tokyo Plan 2000 includes part of this)
- 1992** Draft Design Guidelines of Dwellings for the Ageing Society completed, targeted to all dwellings, not just for public ones.
- 1993** Fundamental Law for the disabled (major revision of the 1970 Law)
- 1993** Law to increase accessibility of communication/broadcast
- 1993** Technical Aids Law
- 1994** International Workshop on Design of Dwellings toward the Ageing Society (Kose, Thiberg, Ambrose, Brink, Morris, BRI/STA)
- 1994** Revision of 'Golden Plan'
- 1994** Accessibility and Usability Buildings Law
- 1995** Fundamental Law on measures for the ageing society
- 1995** Ministry of Construction issued Design Guidelines of Dwellings Toward the Ageing Society. In 1996, they were linked to government subsidized housing mortgages. (This is the most

influential, as far as I know. The mind set of people was completely changed.)

- 1997** Science and Technology Forum on Designing for the 21st Century in Fukui Prefecture (Kose and Ostroff)
- 1997** Universal Design Award established within Good Design Award.
- 1997** Book written by Kose, titled Age of Barrier-free Design published
- 1997** Law on insurance for care of the aged (implemented in April 2000)
- 1998** UD symposium held in Tokyo (Kose, Nikkei Shinbun)
- 1998** UD International Workshop held in Yokohama (Kose, Ostroff, Coleman, Trachtman, Young, Fern, BRI/STA)
- 1999** Housing Quality Assurance Law (implemented in 2000, which included design for ageing features)
- 1999** UD International Symposium held in Tokyo (Kose, Steinfeld, Mueller, OZONE/Tokyo Gas)
- 2001** Securing Housing for Seniors Law, with Design Guidelines
- 2001** UD International Symposium held in Kumamoto Prefecture (Fletcher, Moore, Story, Kose, Kawahara, Kawauchi, Sekine)
- 2001** UD International Symposium held in Tokyo (Kose, Pirkl, Drabbe, OZONE/Tokyo Gas)
- 2001** Securing Housing for Seniors Law
- 2002** Accessibility and Usability Buildings Law Revision

## Chapter 19

# Universal products in the US

**James Mueller**

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Universal design is an approach to the development of products and environments that people of all ages and abilities are able to use to the greatest extent possible. Though this approach is often most beneficial to older customers and those with disabilities, universal design benefits everyone to some degree. Everyone who has lived long enough knows that mental, physical and sensory abilities can change at any time – even among young, healthy people. Limitations can be caused by situation and environment as much as by personal abilities – noisy environments can impair hearing and ability to concentrate, dimly lit rooms can limit vision, and flu symptoms can reduce strength and stamina.

Universal design recognizes, respects, values and accommodates the broadest possible spectrum of human ability. It requires sensitivity to and knowledge about people of all ages and abilities. When done well, universal design eliminates the need for special products or features that may be stigmatizing, embarrassing, and expensive.

Universal design is a marketing tool as well as a design concept; products that are more universally useable are marketable to a much wider audience. Universal design sees people with disabilities as customers, rather than as patients, clients or service recipients. As a result, people with disabilities have available more products at better prices and greater choices in style, size, features and price. Other customers benefit as well from universal design's safer, more comfortable and usable products. Producers benefit from an expanded market without creating additional products.

The term 'universal design' is attributed to the architect Ron Mace, who was instrumental in developing and promoting architectural accessibility standards from the 1960s until his death in 1998. Mace's concept of design for all ages and abilities was formally introduced to the industrial design community in 1993, when a Special Interest Section on universal design was formed within the Industrial Designers Society of America (IDSA).

Between 1993 and 2002, the universal design Section grew from nine members to over 600. While aging designers may be among the strongest advocates of the concept, interest is also high among students and those new to the profession. This bodes well for the future of industrial design, as signs are everywhere that design for all ages and abilities will be a hallmark of industrial design in the

### Principle one: equitable use

**The design is useful and marketable to people with diverse abilities. Guidelines:**

- **Provide the same means of use for all users: identical whenever possible; equivalent when not**
- **Avoid segregating or stigmatising any users**
- **Make provisions for privacy, security and safety equally available to all users**
- **Make the design appealing to all users**

twenty-first century. U.S. Legislation requiring access to computer and telecommunications equipment, the affluent baby-boomer generation, elders aging in place and constant improvements in medical care and independent living will focus even greater attention on universal design in the years to come.

As impressive as medical progress has been, physicians cannot yet stop the aging process. We may want both to defy and even lie about the aging process, but we still prefer it to the alternative. We want to live long and well. The good news is that designers have a critical role to play in fulfilling this desire. Barriers to enjoyable, productive, independent living throughout life can be overcome through universal design. This is only fair, since we designers ourselves designed most of these barriers. With all the attention given to the size of the elderly population in the US, this segment is an even larger proportion of the population in the UK, France, Sweden, Germany and Japan. As a result, worldwide interest in universal design is rapidly growing. Examples of how this relates to the business world abound.

### Why universal design is growing in the US

About 15% of the U.S. population experience one or more chronic conditions that restrict their activities (McNeil, 1997). Limitations of vision, hearing, and strength are natural to the aging process. Most of these people prefer independent living to institutional care. More than seven million Americans live in homes adapted to their limitations. Homes designed and furnished with the 'average' homeowner in mind become less useful and more dangerous as the occupants age. Aside from well-documented hazards such as stairs and bathrooms, home products present a variety of barriers to safe and independent 'aging in place.' Product packaging designed to foil small children causes any elders to rely on knives, scissors, pliers, and persistence to overcome.

Eternally-young baby boomers are coming face to face with middle age. Fully 1/3 of the US population, including baby boomers (born 1946-1964), will be over age 55 by year 2020.

Americans can expect much longer lifespans than their grandparents (the average life expectancy in 1900 was only 47 years). Some bad habits notwithstanding, we can also expect to be healthier throughout our lives, thanks in large part to medical advances such as joint replacements, cardiac care, and pharmaceuticals, public health

improvements in nutrition and hygiene, and (in small part for most of us) our own healthier lifestyles.

Most people with disabilities are not born with them, but develop them during the course of their lives. As more people live longer lives, the likelihood of experiencing a disability during one's lifetime increases. Medical progress has had a profound effect on treatment of illness and accidents which a short time ago were fatal. More than 3 million Americans each year survive severe auto accidents, sports injuries, strokes, and heart attacks (Lowery, 1994). From 1970 to 1997, the survival rate from strokes more than doubled, and the survival rate from traumatic brain injury improved from 10% to 90% (Jones and Sanford, 1997).

The workplace is the site of millions of injuries every year. Many employees become physically disabled and remain off work for months, and some never return. This is expensive and wasteful. Repetitive motion injuries and back injuries are among the most prevalent and costly.

## About this chapter

In this chapter, we will review how the concept of universal design has evolved within the U.S. product design community over the last two decades. Since 1982, the author of this chapter has served as a universal design consultant to US product designers and manufacturers, as well as a consultant to federally-funded projects such as the Trace universal design Research Project. He has also served on the Industrial Design Society of America (IDSA) universal design Section and is currently its Chairman.

From 1994-1997, the author directed a project funded by the US Department of Education at North Carolina State University's Center for Universal Design. This project, 'Case Studies on universal design', explored how the US business community was applying the Principles of universal design (Center for Universal Design 1997) to its business practices.

In 1998, the Center for Universal Design embarked on a five year programme to further study companies' efforts toward applying universal design in their businesses. By then, even greater sensitivity was prevalent toward aging customers (fuelled by baby boomers by then even closer to becoming elders). Additional legislation

## Principle two: flexibility in use

**The design accommodates a wide range of individual preferences and abilities.**

### Guidelines:

- Provide choice in methods of use
- Accommodate right or left-handed access and use
- Facilitate the user's accuracy and precision
- Provide adaptability to the user's pace

### **Principle three: simple and intuitive use**

**Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.**

#### **Guidelines:**

- **Eliminate unnecessary complexity**
- **Be consistent with user expectations and intuition**
- **Accommodate a wide range of literacy and language skills**
- **Arrange information consistent with its importance**
- **Provide effective prompting and feedback during and after task completion**

had also been passed, including requirements that electronic and telecommunications products be usable by citizens with disabilities. These and other factors, including media coverage of the disabilities of several famous actors and athletes, stimulated a number of US companies toward greater interest in universal design.

This chapter will present progress toward universal design within some of these US companies, as illustrated through case studies developed by the Center for Universal Design in Raleigh, North Carolina and by the Trace Research and Development Center in Madison, Wisconsin.

### **Trace Center's universal design research project**

Beginning in 1997, The Trace Center in Madison, Wisconsin conducted a three-year universal design research project. Like the case studies project at North Carolina State University, Trace Center's project was designed to identify factors that affect the implementation of universal design within US businesses. A total of 22 companies were selected for study. The companies included large and small firms drawn from telecommunications, media and materials, "edutainment," computer, and built environment industry segments.

The Trace project revealed important positive and negative factors affecting the application of universal design in business. The factors identified include both major 'show stoppers' as well as other smaller factors which help or hinder (Trace Center web site 2002), e.g.

- Size of the company.
- Cost of the effort.
- Government regulation.
- Access to universal design research and development resources.
- Support from outside the company.

### **Case studies at the Center for Universal Design**

In seeking appropriate businesses to study, the Center for Universal Design applied criteria that had surfaced during its initial study among the most effective subject companies, as well through the Trace Center's research:

## Active participation of management

First and foremost, companies must want to tell their stories, with the explicit approval of top management. Early efforts to identify candidates for case studies emphasized the need for cooperation in collecting thorough project documentation and in dissemination of the final study results. Therefore, initial contacts with case subjects focused on establishing those companies whose management were most interested in cooperating. Unfortunately, this excluded some companies with insufficient resources to gather and share information, those fearing that their products might be exclusively identified with seniors and people with disabilities, those fearing negative publicity, and those seeking to protect proprietary information.

## Diversity in corporate structure and resources

This project sought to present universal design experience valuable to companies of diverse size and structure, from small, self-contained businesses to those incorporating multiple facilities and external design, research and development resources. These characteristics strongly influence whether and how a specific business approaches the opportunities and challenges of universal design. Therefore, as cases were selected, variety in corporate structure and size was carefully considered.

## Diversity in corporate culture

Regardless of the market drivers and deterrents acting on universal design efforts, most companies exhibit initial cultural tendencies toward or against the concept. For example, Leviton Manufacturing Company's multi-generational family ownership strongly influenced management sensitivity toward the needs of senior customers. In other cases, corporate sensitivity to its market image can inhibit a company's universal design efforts, such as among youth-oriented companies with little aging or disability experience among its workforce. Examples of this cultural diversity were sought in the selection of case study subjects.

## Influence of fears and interests

Some companies are inhibited by their concerns about alienating existing customers in the effort to include seniors and customers with

### Principle four: perceptible information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

#### Guidelines:

- Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information
- Maximise legibility of essential information
- Differentiate elements in ways that can be described (i.e. make it easy to give instructions or directions)
- Provide compatibility with a variety of techniques or devices used by people with sensory limitations

disabilities. Others fear that the risk of negative publicity – or even litigation – for failure in this field far outweighs potential gain for success. On the other hand, some companies are stimulated by the opportunity to differentiate their products in a highly competitive marketplace through new concepts such as universal design. Examples of the influences of these fears and interests were sought as well.

### **Penetration within company**

Some very interesting applications of universal design have been the result of the efforts of a few people within the organization. However, the purpose of these case studies was not to stimulate isolated projects, but to encourage fundamental changes in approach to commercial design and marketing. Therefore, those cases demonstrating the involvement and cooperation of (at least) the design and marketing departments were felt to be most effective in showing how these internal changes can take place. By selecting those candidates where universal design had been the result of interdepartmental cooperation, it was hoped that methods for overcoming barriers to this cooperation would emerge.

### **Significant technologies**

To be a persuasive case study in universal design, the products selected must be widely available and potentially significant to consumers of all ages and abilities. Examples include products in common everyday use, e.g., automobiles and household appliances, products vital to health and independence, e.g., pharmaceuticals and personal care products, and new and innovative products with significant potential impact on the general population, such as home health care and telemedicine products. For example, a case study on Tupperware kitchen products previously developed had been very effective due in part to common experience with Tupperware products across several generations.

### **Government influences**

Federal legislation or policy is often an influence on the implementation of universal design. The influence of the Americans with Disabilities Act on business furniture manufacturers Herman Miller and Steelcase and the Telecommunications Act on wireless communication manufacturers such as Nokia are just a few examples.

Businesses may view federal regulation positively or negatively, i.e. as opening a new market opportunity or establishing yet another set of rules to follow. In either situation, cases influenced by federal regulation offered another opportunity to study the forces acting on the implementation of universal design.

## Project maturity

Some interesting applications of universal design had not yet progressed beyond the model or prototype stage. These applications may be among the most innovative, but do little to demonstrate the development of strategies critical to bringing innovative designs to market. For this reason, case subjects demonstrating impact in the marketplace, e.g. production, distribution, and sales figures, consumer feedback, and/or competitive response, were preferred. Also desirable were projects mature enough – and successful enough – to demonstrate impact on the company's corporate culture and/or subsequent product offerings, such as the impact of the success of Fiskars' Softouch Scissors on later designs for garden shears and other cutting products.

## Media exposure

Much can be learned from the publicity a company generates or receives for its universal design efforts, whether perceived as positive or negative. Important to the selection of subjects was the availability of examples of the company's advertising of its universal design efforts and any mass media exposure these efforts have stimulated. An interesting example was Oxo International's Good Grips kitchen tools, which achieved its worldwide notoriety without benefit of an advertising budget. Although valuable lessons can be learned from both positive and negative publicity, it has been the author's experience that those companies with favorable publicity are understandably more anxious to participate in projects such as this. For this reason, winners of design or other awards were a primary focus of the search for potential case study subjects. Participation on the American Society on Aging Design Jury facilitated the author's exploration of promising new designs for potential case studies. Follow up with winners of IDSA's annual design awards also yielded potential case subjects.

### Principle six: low physical effort

**The design can be used efficiently and comfortably and with a minimum of fatigue.**

#### Guidelines:

- Allow user to maintain a neutral body position
- Use reasonable operating forces
- Minimise repetitive actions
- Minimise sustained physical effort

## Principle seven: size and space for approach and use

**Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture or mobility.**

### Guidelines:

- **Provide a clear line of sight to important elements for any seated or standing user**
- **Make reach to all components comfortable for any seated or standing user**
- **Accommodate variations in hand and grip size**
- **Provide adequate space for the use of assistive devices or personal assistance**

## Some case study examples

Since 1994, 52 individual business applications of universal design have been studied by the Center for Universal Design. Twenty-one of these examples have been developed into business case studies and published. One of these was fully developed into a business teaching case in 1997 through Design Management Institute and Harvard Business School and is distributed worldwide by Harvard Business Publishing. Several of these case studies have been selected for this chapter to illustrate how the concept of universal design is evolving within the US consumer product design community.

### Ford's focus on ageing drivers

The 2000 Ford Focus was cited by Consumer Reports magazine as "very easy to get in and out of; the cabin has a spacious, airy feel, and the driving position is high, which makes for good visibility." Also noted was the spacious boot, rear-seat room, "climate-control switches that are easy to use and radio buttons that aren't a stretch to reach." (Consumers Union 2000).

These advantages are hardly accidental. The car's development programme coincided with heightened awareness of the needs of older drivers among designers and engineers. Jeffrey Pike, a design analysis engineer at Ford, described how the company had begun to design for the growing population of senior drivers by sensitising staff to the ergonomics of aging. "As we grow older, our vision changes," he remarked. "We're more susceptible to glare, and we don't adapt as quickly to changing conditions."

"It's one thing to read customer feedback in a marketing study," said Vitek Bhise, Ford's manager of human factors and ergonomics. "It's a whole different thing to feel what they're feeling while driving a car." Feeling the effects of changes in vision and other functional changes that come with aging was what Ford's 'Third-Age Suit' was all about (Photo 19.1). "With the Third Age Suit, you lose about 25 percent of your strength, you have about 25 percent less flexibility and it's harder to get in and out of a car," added Gretchen Zorbel, a Ford human factors and ergonomics engineer.

The Third Age Suit was the result of a series of experiential workshops based on an exercise developed in Canada and organized by Age Concern, a UK charity. Workshop participants wore goggles,

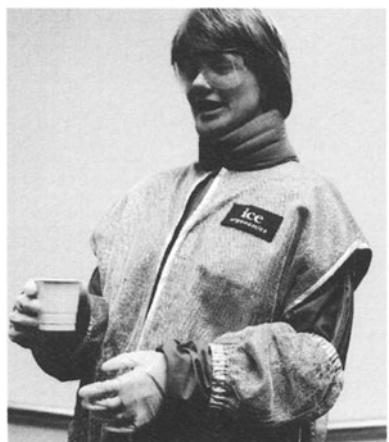
ear plugs, restrictive arm bands, wrist and ankle weights and gloves to simulate the reduction in sensory abilities, range of motion and strength that can occur with age. Participants were then given everyday tasks to perform, using only their residual abilities.

Ford's design development teams began using the Third Age Suits in ergonomics research to look toward the future needs of their customers. "The numbers show that mature and elderly drivers are becoming an increasingly large percentage of the motoring public," explained Richard Perry-Jones, Ford's vice president for product development. "With the Third Age Suit, we believe we have an advantage in knowing what that large demographic group demands."

One of Ford's television ads pictured a group of 20-something passengers barely wedging their Ford Focus into the last available space in a parking garage. Realizing they couldn't open the doors, they popped the rear trunk open and climbed out over the folded-down rear seats. Another ad for the same product featured a similar group apprehensively holding full cups of coffee as their car rolled over a series of railroad tracks, demonstrating the car's smooth ride. Ford's advertising could just as easily have demonstrated the ease of entry and exit for a cane-user with the Focus's extra-wide doors and a number of other features especially useful for drivers with limitations due to age or disability. But Ford chose to follow a long-held automotive marketing tenet: "You can sell a young man's car to an old man, but you can't sell an old man's car to a young man."

The Ford Focus story is one of many involving the application of universal design to develop products that are more universally marketable. Each of the subject companies were successful businesses, and the decision to adopt a universal design approach had to be justified economically. Any increased costs in design, production, or marketing required a projected increase in sales. In addition to the business successes within stories such as the Ford Focus, several lessons have emerged from these case studies.

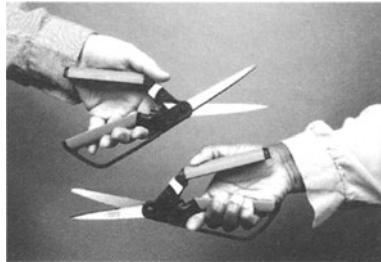
**The 2000 Ford Focus was cited by Consumer Reports magazine as very easy to get in and out of; the cabin has a spacious, airy feel, and the driving position is high, which makes for good visibility**



19.1 Third Age Suit.

## The Importance of personal commitment

In nearly every case, the personal experiences of a company employee, a family member of an employee, or an executive stimulated by a television or print media story about an individual with a disability created an emotional commitment that fuelled the organisation's



**19.2 Fiskars Softouch scissors.**

investment in universal design. This commitment helps drive an organization's investment in universal design and provides the additional energy needed to maintain the momentum of the idea in the face of corporate inertia. For example, the idea for Oxo International's now-famous Good Grips was born when Sam Farber's wife Betsey began to have difficulty using kitchen utensils due to arthritis.

After reading an article in 1989 about the impact of arthritis, a Fiskars vice president initiated an exploration into design specifically for this market. Fiskars designers added their own personal insights from family members with the disease. The resultant product proved to be useful for other target markets as well, and the award-winning Fiskars Softouch scissors (Photo 19.2) was introduced in 1991. Since then, Fiskars has applied the successful design to their Softouch Floral Shears, Power Lever Pro, and Softgrip Multi-Snip tools as well.

Gold Violin is an internet marketer of products for seniors. Unlike other companies marketing to seniors, Gold Violin approaches the unique lifestyles of seniors and seeks products that support them with style. CEO Connie Hallquist says, "I created Gold Violin for the heroes in our world—people like my grandmother who live rich long lives and inspire us with their experience and insights... "I figured I wasn't the only one frustrated by trying to find special things for older relatives". Millions of baby boomers are starved for time, juggling jobs, their own families and aging parents."

When Morison Cousins undertook the redesign of Tupperware's products in 1990, he kept in mind his 87-year-old mother. For her and other long-time Tupperware customers, the original narrow lip seals were made easier to grasp by replacing them with larger seal tabs and double-arc handles (Photo 19.3).

Leviton Manufacturing Company's involvement with applications of home automation for people with disabilities brought some of their managers face-to-face with people with disabilities for the first time in their lives. The experience changed the way they saw their customers and their company. Said Bill Marshall, Leviton's Vice President of Marketing, "Universal design has become an extremely important idea to us – maybe the most important idea." (Mueller and Ingols, 1997)

## The impact of legislation

At least part of the reason for interest in universal design for 10 of the companies reviewed was federal legislation such as The Americans with Disabilities Act (ADA). For some, it was the primary reason.

Shortly after passage of the Americans with Disabilities Act in 1990, customers of business furniture manufacturer Herman Miller, Inc. began to query the company's sales reps regarding compliance of their office furniture with the guidelines of this law. In response, the company developed an instructional video and technical manual describing the features of each of its products which benefit users of diverse ages and abilities.

Title III of the ADA requires that private entities such as restaurants, hotels, and retail stores may not discriminate against people with disabilities. This means that physical barriers in architectural and interior design must be removed wherever readily achievable, and that all new construction and alterations to facilities be designed to be accessible.

Title I of the ADA requires that all employers with 15 or more employees make 'reasonable accommodation' for employees with disabilities. This law materially affects businesses' investments in furniture, materials handling equipment, tools, data processing equipment, and other products which a disabled employee might use in performance of his or her job.

Federal legislation also requires that a percentage of public housing be accessible to people with disabilities. By offering superior product accessibility over its competitors through its Appliance Information Service, Whirlpool Corporation was able to win major appliance contracts for these large-scale public housing projects.

The passage of the Telecommunications Act of 1996 and the Rehabilitation Act Amendments of 1998 established requirements for U.S. electronic and information technology manufacturers to make their products usable for persons with disabilities. Evidence of the impact of these laws can be seen by visiting the websites of major producers of telecommunications, data processing, and other electronic technologies. For example, Nokia established an Accessibility Solutions committee to address the needs of customers with disabilities:

"Many of our phones and accessories already make functions easier, even though they were not developed directly for disabled consumers."



19.3 Tupperware containers.



19.4 Good Grips peeler.

We're taking that one-step further and designing specifically with accessibility in mind." said David J Dzumba, Director of Industry Solutions for Nokia Corporation.

Section 255 of The Telecommunications Act of 1996 requires that all manufacturers of customer telecommunications products, including cellular phones, be usable by people with disabilities. In 1998, Section 508 of the Rehabilitation Act Amendments was passed, adopting the Section 255 requirements in guidelines for procurement of information technology by all federal agencies. As a \$40 billion per year customer, the federal government effectively mandated universal design not only for telecommunications equipment, but for all electronic technologies. Section 508 took effect on 21 June 2001.

"At first, we viewed this as a legislative requirement," said Dzumba, "but as we got more involved and realized the impact we could have, it became a mission." As an example, the Nokia LPS-1 and LPS-3 Loopsets allow people with hearing aids to use digital mobile phones without the typical buzz/hum interference. First launched in Europe in April 1998 and later in the US, the Loopset was designed by senior Nokia engineer Mikko Haho, hard of hearing since birth. (Mueller, 2001)

### Advantages of universal design in the marketplace

Several of the universal design 'pioneer' organizations, some with experience dating back 20 years or more, noted the advantages of being first into the field. Modest efforts yielded comparatively large amounts of media coverage, worth hundreds of thousands of dollars annually. Subsequent efforts by competitors were less news-worthy. Whirlpool Corporation, whose technical assistance to elder customers and those with disabilities, begun in 1981, was regularly cited in widely-circulated monthly publications such as Better Homes and Gardens.

Sam Farber established Oxo International in 1990 with the introduction of Good Grips at a San Francisco show. Their distinctive, inviting design drew considerable press coverage. With nearly no advertising budget, Oxo International grew at a 40-50% annual rate from 1990-1995, to \$20 million in sales (Photo 19.5).

Designers and their clients who have successfully ventured into universal design know the potential of this new paradigm. However, they are usually protective of sales and marketing data. They are eager to maintain their market advantage, and with good reason.

## Opportunities created by new technologies

The vast majority of elders prefer to live in as much a home-like atmosphere as possible. This has fuelled a building spree of home-like assisted living facilities in the US, with occupancy rates over 90% and return on investment of over 17%. In addition to architectural accessibility of these facilities, usability of the appliances and other products inside are crucial to the success of assisted living for those with functional limitations.

New home health care technologies make it possible for individuals with chronic disabling conditions to carry on independent lives rather than depend on institutional care, as in previous generations. The proportion of older people able to perform their own daily activities has increased 1-2% every year since the National Long-Term Care Survey began gathering this data in 1982. These people may have disabilities, but they may also drive a car, go to work, wash their own laundry, and cook their own meals.

Increasing costs of institutional care, restrictions on inpatient care by managed-care organizations, and the desire to 'age in place' by individuals with conditions requiring regular medical monitoring are driving the development of telemedicine products and services. Building on the success of home diagnostic tests such as those for pregnancy and glucose levels, technologies for managing chronic disabilities are developing rapidly. Home kidney dialysis and cardiac pacemaker monitoring are two of the procedures which previously required in-patient professional care but are increasingly done in the home, with minimal professional supervision.

Telemedicine began in the 1960s with the use of ordinary telephone and wire communications by physicians who were physically remote from their patients. Since then high-speed data lines, advanced data compression technologies, and computerization of patient records have made telemedicine a much more powerful clinical tool.

Philips' Interactive Healthcare Services was among the first to employ telecommunications technology for remote monitoring of patients' vital signs. Using portable, battery-operated measurement units which operate automatically or with a single push of a button, patients take their vital signs daily. The portable units transmit the data and the time by radio frequency automatically to the home telecommunications

'hub'. The hub then transmits the data, using ordinary phone lines, to a comprehensive patient database accessible to the health care provider.

### **Additional lessons from business cases**

Companies studied through the Center for Universal Design presented a rich supply of insight into the realities of implementing universal design in business:

- 11 of the companies studied used universal design experts from outside the company for design and/or technical assistance.
- Among at least four of the product manufacturers reviewed, awareness of the concept of universal design followed, rather than preceded, efforts to integrate the needs of a specific market, e.g. customers with arthritis.
- Consumer product manufacturers were generally very sensitive to any increases in additional cost due to incorporating universal design features. In at least two cases, an increase of less than 5% of the retail price was sufficient to prohibit the addition of these features.
- Consumer product manufacturers inexperienced in applying universal design concepts proved most sensitive to the potential stigma of designing for the needs of elders and those with disabilities. On the other hand, manufacturers with successful experience did not shy away from publicising it.

### **Universal design in business education**

The Center for Universal Design recognizes the importance of marketing issues in promoting universal design. Furthermore, reaching students in both the design and marketing fields is a priority, since concepts embedded through an educational setting can be carried throughout a career.

Follow-up on the case developed for Harvard Business School offered a unique opportunity to examine the impact of this effort over time. Initially published in 1997, Leviton Manufacturing Company: universal design Marketing Strategy has achieved considerable circulation, given the newness of this case to Harvard's catalogue. In 2001, Harvard Business Publishing was contacted for the list of purchasers of the 1100 cases circulated to date. It was also learned through an internet search that this case was being taught by many

other schools, copyright restrictions notwithstanding. Using Harvard records, letters were sent to 49 professors at business schools around the country and in eight foreign countries.

Among the responses of these business instructors were several observations:

- Level of use among these instructors varied widely. Some teach a given case no more frequently than two-year intervals, others as frequently as every semester. There are ample opportunities to add new cases on topics such as universal design.
- Four responding professors had not yet used the case study. For some, this was due to changes in class format. Others felt the case did not suit their purposes or teaching style. One mentioned that he did not know enough about the subject area to be comfortable in teaching it. (The author followed up with this professor by providing additional information and a Teaching Note.)
- Those who have taught the Leviton universal design case have stated that this case was very popular with students. This was partly because it introduces an unfamiliar concept and teaches a valuable lesson about reaching new markets with mainstream products (greater economies of scale), rather than producing 'special' products, which are just too expensive to produce in today's economy. Some instructors observed that it was the only case available on marketing to elders and/or was effective in teaching issues of marketing services, as well as products, to elders.

## Summary

The confluence of demographic, economic, legislative, social, and technological factors that have created a fertile environment for the growth of universal design in the United States are not unique to this country. Many of the companies mentioned in this chapter do business around the world. The factors which stimulated their interest in universal design are likely to become more influential on businesses worldwide in the 21st century. It is hoped that this will help stimulate not only greater focus on equality for persons of all ages and abilities, but also a more global effort toward that goal.

## Acknowledgements

US Department of Education, and the National Institute on Disability and Rehabilitation Research, for their generous funding. Images: Fiskars scissors and Tupperware containers courtesy the Center for Universal Design; Good Grips courtesy Reader Communications.

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## Chapter 20

# International design education strategies

**Elaine Ostroff**

Global Universal Design Educators' Network



This chapter highlights the diverse ways that individuals and institutions around the world have invented teaching and learning opportunities to prepare designers for an inclusive society. The examples vary widely in both scale and impact, ranging from a course module to a certificate programme, a research project, a degree programme, nationwide interdisciplinary projects to an ongoing student awards programme. Each was developed as a thoughtful response to a need at a local, regional, national level or international level. All have developed creative ways to infuse human-centred design into professional design education. The examples include the 1970s work of pioneers Jim Sandhu of the United Kingdom and Ray Lifchez of the United States along with more recent work from Canada, England, Ireland, Japan, Norway, and United States. A new programme, Access to Design Professions, asserts that the participation of disabled people in the design professions will generate more equitable design.

The following examples of design education reflect creative partnerships between designers and users. Designers bring their imagination to celebrate the world as it really is – a variety of cultures with a wide and diverse range of human abilities and needs. Users all ages, abilities and economic status can inspire, challenge, and inform designers. The involvement of users will help assure that whatever is designed – buildings, products, information – welcomes and facilitates the participation of everyone. These partnerships lead to a higher consciousness that the process of designing is not something created by ‘them’ for ‘us’ but something that we accomplish together.

The educational strategies also exemplify the growing recognition of the importance of the environment on human potential and the changing concept of disability. The definition of disability has shifted from the emphasis on the individual to be treated, to the increasing awareness that disability is the result of the interaction between the individual and the environment. Design can enable or disable. Design has the power to include or exclude.

I cannot ride the public buses. Is this because I use a wheelchair or because the buses are not accessible?

(Adolf Ratzka, 1999)

I cannot ride the public buses. Is this because I use a wheelchair or because the buses are not accessible?

## Early beginnings

Two designers whose work has been a major influence in universal design education and practice are Jim Sandhu of the United Kingdom and Ray Lifchez of the United States. Much of the following is in their own words as they reflect on their work in the early 1970s.

### Polytechnic of Central London – Jim Sandhu, 1972

Sandhu developed a course at the School of Architecture, Polytechnic of Central London. Design for the Non-Average was offered within the Diploma Course. The course description that he wrote explained that the aim of the option was to generate information, clarify and develop concepts, methods, and team and personal involvement in theoretical research and practical design projects. He wanted students to examine the relationship between the design process and the built environment from the viewpoint of a range of users – those with special needs and those who are average.

Sandhu recalled that the course had the option of studio work or some extended essay or thesis and that the most outstanding studio project resulted in a practical flatpack cardboard house which was cheap, easy to construct and very versatile. Students used Triwall, a strong and light cardboard material. The project started with an effort to meet student-housing needs and then opened up for emergency housing for the majority world, adding concrete or adobe on the outside. There was wide publicity for the two students who designed the folding house, with a big impact on those students who had thought the course a waste of time.

The fact I was an industrial designer (amongst other qualifications) and not an architect was the biggest hurdle by far in getting my new course off the ground.

(Sandhu, 2002)

### University of California – Ray Lifchez, 1973

Ray Lifchez began involving users in the traditional design studio as a way to introduce students to the opportunities of designing for someone unlike themselves. Lifchez's teaching is well documented. Rethinking Architecture (Lifchez, 1997) chronicles and evaluates the studio from several perspectives. Lifchez's reflections as the instructor

are included with chapters written by other faculty, the consultants with disabilities and the outside evaluator. He later described his early experiences in Berkeley.

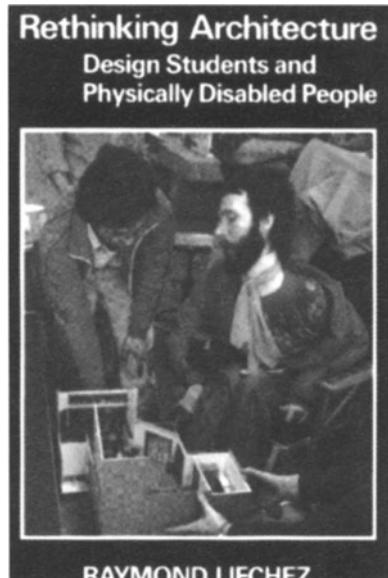
My personal interest and involvement in the disability movement dates to my arrival in Berkeley in 1970. The number and variety of people using wheelchairs immediately struck me. I was told that Berkeley was the 'crip capital' of America. The facts about Berkeley soon emerged: the history of its new, original institutions, such as the Center for Independent Living (CIL), created by young people with physical disabilities...the accumulated knowledge about such subjects as how to make houses accessible ... and how to achieve better health and personal dignity through nonmedical practices. Alongside this thriving subculture was the University of California, committed to making higher education accessible to physically disabled students.

(Lifchez, 2002)

Lifchez was a new professor of architecture at the University of California, Berkeley when he volunteered to help with plans to facilitate access. At the same time he was assigned a large undergraduate studio course in architectural design. The objective of the course was to teach design skills within a framework of social issues, to give beginning students a social awareness that would lead them to create accommodating designs. Gradually, he began to invite some of his disabled friends to visit the design studio to talk about the students' work. They observed and commented on whether or not they could live in the buildings the students were designing and these occasional visits became, eventually, a part of the studio curriculum. Ray believes that this is a way for students to become very aware of all users – older people, people with disabilities, children.

It is not just about access, it is about the relationships between all users. People with disabilities are 'super environmental professionals' who in their everyday lives deal with the complexity of the physical environment. They have an enormous amount to teach the students.

(Lifchez, 1997)



Consultant Peter Trier works with architectural students.

## Canada

These two Canadian examples differ from others that are discussed in the chapter. They are not about educating designers but rather about people who have significant impact on the design and construction process. The Sheridan College project is from a programme for architectural technologists and the University of Manitoba programme trained people with disabilities to become access consultants.

### Sheridan College

#### Teaching architectural technologists

Bob Topping is an architect who teaches universal design within the Architectural Technology programme at Sheridan College, a community college near Toronto, Ontario. The architectural technology course is a three-year diploma programme in which students focus on the construction side of the whole design and construction process, rather than the design side. The technologists are used in many places to support the design process, the drawing development process, and the construction process. They play a vital role in turning design ideas into practical, workable buildings and he believes that architectural technologists are another important profession to influence in order to advance the universal design agenda.

Topping uses an unusual approach to help the students fully appreciate the seven principles of universal design. It is a module called the 'Seven Deadly Sins' and it can be found on the Universal Design Education Online website (Topping, 2002). Students were advised to choose any site that they like, but it must be a real site and the presentation must include some site context. The surprise challenge that he gave was for the students to use their design to *exclude* as many people as possible from using the building. Their goal was to *not* comply with as many of the seven universal design principles as possible. He reflected on the assignment:

The project was assigned to students enrolled in the third year of the architectural technology programme. The project was strategically placed as the penultimate assignment for the course – a chance to have some fun before the final (heavily weighted and important!) assignment. Prior to the commencement of this project, students had studied the principles of universal design

and had researched and critiqued examples of the successful application of universal design...They seemed to better understand the basis of each principle and how to apply within the design process ...The involvement of a diverse user group was a key element in the project. Although I was very nervous about the reaction of the user group to some of the more radical design ideas (e.g. the only access into the building was via a ladder!), the group was not offended and had lots of fun.

(Topping, 2002)

### **University of Manitoba Universal Design Institute,**

The Universal Design Institute (UDI) at the University of Manitoba has a long history of user-centred involvement. It was formerly the Canadian Institute for Barrier Free Design.

The UDI led a course to train consumers who wanted to become consultants. It was offered in seven locations across Canada. The Manitoba League of Persons with Disabilities and the Canadian Human Resources Development Fund underwrote the course. The curriculum was developed in consultation with the instructors, Betty Dion and Gail Finkel, two universal design researchers and advocates in Canada.

Two of the graduates of the course were hired by the city of Winnipeg as consultants on a streetscaping project that was extremely participatory. The process involved the disabled consultants along with a diverse group of stakeholders including older people, street kids, the policy makers, building code officials, and designers. The user involvement process is more fully detailed in her chapter User-Expert Involvement in Universal Design (Ringaert, 2001).

**The involvement of a diverse user group was a key element in the project**

### **Ireland DraWare Project**

The European Community funded the DraWare Project at the School of Architecture, University College, Dublin, Ireland. It was a two-year research project, from 1988 to 2000, to experiment with teaching methods that would lead to the creation of a more universally usable environment. It also worked beyond the college, to raise awareness in the profession. The DraWare team was John Olley, Ruth Morrow and Fionnuala Rogerson in cooperation with the design tutors in the school



of architecture. The project organisers were sensitive to the resistance to change in an educational system and understood that the traditional methods of teaching reflected values that were different from their own (Morrow, 2001).

Although the relationship between people and space seems fundamental to the practice of architecture, there were few explicit requirements from the Architect Registration Board, the organisation that accredits the curriculum in architectural schools. The project worked to reconnect the students to deeper understanding of the end user, and worked across the whole architectural programme to help students recognise the dangers of designing for the abstract and stereotypical user. Morrow noted that a universal design approach was incorporated into lectures, history/theory seminars and design studios.

Not only did the DraWare project provide much deeper awareness of the users, it fostered much better interactions between students. The project used multiple strategies to embed and infuse an interactive learning process across the curriculum. Real-world problems were addressed in concert with individuals and organisations in the community. Morrow describes and illustrates the project on the Universal Design Education Online website (Morrow, 2002).

## Japan

### NEC collaboration with Tama Art University

The four-year collaboration between NEC, a large Japanese electronics company and Tama Art University was inspired by Japan's rapidly aging society and the need to design usable and appealing products. It achieved important results for the company and for the university. The company developed a universal design process for products and the university had a revised curriculum that infused universal design throughout all four years of their industrial design programme.

When the project began in 1996, experience centered workshops provided the first introduction to the needs of diverse users, through active participation with older and disabled people. Guidance and evaluations by NEC engineering professionals gave feedback from the high tech production side; feedback from the users helped students reassess their design concepts, with concrete ideas for improvement. The project demonstrates an interest in long-term commercial benefits. These benefits coincided with the new United States law,

section 508, that requires federal agencies to purchase only electronic and information technology that is fully accessible to persons with disabilities. This was a powerful incentive to convince top management of the consequences of *not* designing universally. The US federal government is too large a potential customer for any company to risk the loss of sales. Chitose Ikeda and Noriko Tanganyika have carefully documented this project through reports as well as a book chapter (Ikeda and Tanganyika, 2001).

## Norway

### Universal design curriculum project

The Norwegian Government began a far-reaching pilot project in 1997 to address what they saw as a fragmented approach to accessibility. They wanted to change the common practice wherein national policies were implemented at a lower level. This purely technical approach was always 'ineffective and poorly coordinated.' In order to elevate accessibility to the necessary stage of master planning they initiated several strategies. One important direction addressed the lack of awareness of user needs, and the need for better methods and outreach for user participation in policy and planning. The other was to integrate universal design skills and attitudes in the universities. The Norwegian Housing Bank led the national project with the involvement of many consumer and other organisations (Bringa, 2001).

They developed a four-year pilot programme with universities across the country, adapting the model used by the US Universal Design Education Project. The approach was to offer schools support for their own creative initiatives based on their own identities and community context. The pilot included programmes in architecture, interior and industrial design, occupational therapy, engineering, planning and vocational schools.

The project created a working structure that proved to be successful. There were planning groups in each discipline, to establish the criteria and priorities for funding and technical assistance as well as an overall advisory group representing the central government and national disability organisations.

(Tone Ronnevig, Project Coordinator 2002)



With the help of a user, students at Tama University discover barriers in products. Credit: Chitose Ikeda.

Over the four years there was a strong shift in the educational approach. Educators moved from occasional lectures about accessibility based on the difficulties experienced by people with disabilities to a more integrated universal design approach that incorporated a wide range of user needs. One of the projects was at the Norwegian University of Science and Technology at Trondheim, in the city and regional planning programme. In one exercise, planning students worked with five user groups to analyse specific parts of the city. The users evaluated solutions to problems. The final exam required that the students discuss the consequences of universal design in city and regional plans.

The approach to the Norwegian project, along with numerous universal design teaching examples from around the world is detailed in a new book published by the Housing Bank (Christophersen, 2002).

## United Kingdom

There are three design education programmes discussed here. The first was a certificate programme for people who are already working; the second is an undergraduate programme; and the third is a long-standing student design awards programme. The work of the Royal College of is not touched on as it is amply covered elsewhere in this book. As is work at Central St Matins College, The London Institute, and the Engineering Design Centre, the University of Cambridge.

### Architectural Association Environmental access programme

Andrew Walker developed and directed this post-graduate course in Environmental Access at the Architectural Association in London. It was the first qualifying certificate from any institution in the world. Andrew is an architect who is expert in historic renovation. It was after his accident on a project that he began teaching at the Architectural Association and became head of Technical Studies (Ostroff E, Limont M and Hunter D, 2002). After thirteen years in that position he became increasingly aware of the need for a new academic programme that would include the people who usually are unheard in the planning and design process. With little funding and strong participation from the disability community, Walker began the Graduate Diploma in Environmental Access.

The aim of the multi-disciplinary post-graduate programme was to bring together those involved in planning, designing, building, and using environments. People who were directly affected by a disabling environment in terms of gender, race, and disability were naturally included as students, educators and innovators. Many of the students came on a work-release programme from their design offices. Modest access improvements were made to the listed building, enabling people with disabilities to get to the ground floor where all course activities were held.

The intense and provocative learning experiences included public lectures by renowned speakers with disabilities. The head of the school recognised the usefulness of the course and began to infuse the experiences into some of the mainstream teaching, in the First, Intermediate and Diploma levels (Walker, 2002).

However, the decreasing participation from the design disciplines resulted in a programme that was no longer multidisciplinary and it ceased operation after five years. Although there is the intent to infuse the experiences and the process of the diploma course throughout the mainstream courses, the lack of funding for full access to the historic buildings has been a major stumbling block. Recent planning indicates that an MA in inclusive design may be established along with the access improvements. Walker continues to emphasise the need to involve users as well as other professions.

It must practically relate to the users and be tested and be broad in scope...The issue is too important to be seen as a specialist exercise...Curricula need to ensure that students will not have to pursue their design education without coming into contact with those for whom they are designing. (Andrew Walker, 2002)

## **University of the West of England Putting people first: designing an inclusive curriculum**

Sandra Manley, University of the West of England (UWE), Bristol, UK explains the development of the BA(Hons) in Architecture and Planning on the Universal Design Education Online website (Manley, 2002).

This is the first undergraduate degree in the UK to combine architecture and planning in one degree, and extensive

consultation was used in the design of the curriculum. It was planned in collaboration with the key architectural and planning organisations in the United Kingdom including the Royal Institute of British Architects (RIBA), Architects Registration Board (ARB) and the Royal Town Planning Institute (RTPI). The programme is unique in the seamless way that universal design is meshed with cultural values and sustainable design. These concepts are infused throughout the four-year programme. The importance of designing directly to meet people's needs was a major consideration...  
(Manley, 2002)

To achieve these aims the course team adopted three words – people, context and sustainability – to act as the key themes of the course. The intention was to try to avoid the simplistic view sometimes adopted by students on modular courses that once an aspect of the curriculum has been taught and assessed it can be dismissed from the mind. Instead each theme would permeate the course. This did not mean that particular modules would not concentrate on teaching knowledge and skills relevant to each theme but it did mean that the key issues would recur for consideration throughout the course.

The people theme broadly corresponds with the principles of a universal or inclusive approach to design. The aim is to ensure that students will constantly be reminded of the importance of the issue of designing to meet the needs of a wide range of clients and users by infusion of the theme throughout the course. Manley is the joint leader of the course design team. The course has had preliminary monitoring and a report is available (Manley S and Parnaby R, 2001).

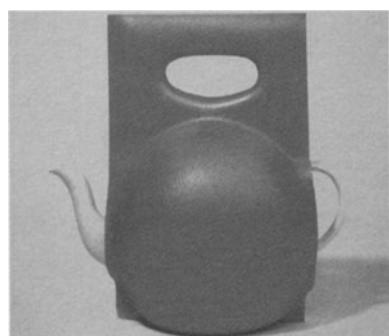
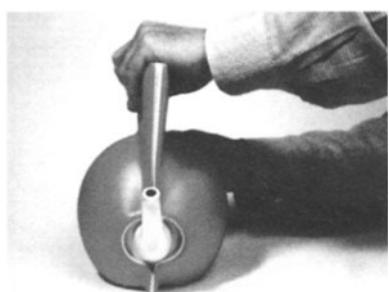
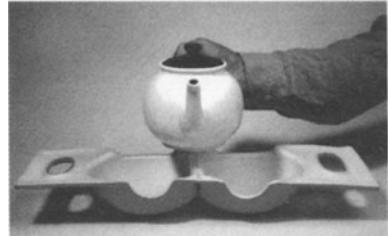
### Royal Society of Arts – Student Design Awards

The UK Royal Society for the Edvancement of Arts, Manufactures and Commerce (RSA) celebrated 75 years of the Student Design Awards (SDA) scheme in 1999. Since its inception thousands of students have benefited from taking part in the competition and working on its challenging briefs; some have gained the opportunity to travel and extend their knowledge of design. The scheme exists to link industry with education and a crucial practical outcome of this link is the possibility for winners to undertake work placements with industry or consultancies throughout the world.

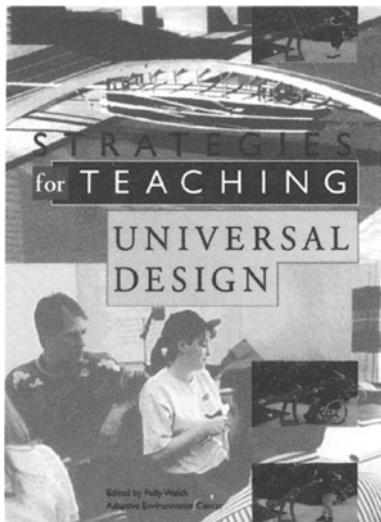
The New Design for Old project, which started in 1986, is a highly influential part of the SDA, creating opportunities for young designers (and tutors) to develop awareness of the issues that inform inclusive design practice. The idea for this project grew out of the 1986 New Design for Old exhibition at the Victoria and Albert's Boilerhouse Gallery, the inspiration of Lady Hamlyn. Having raised the profile of designing products which could be both user-friendly for older people and acceptable to a broad range of ages through this exhibition, the idea was to maintain this interest and try to encourage the up and coming cohorts of designers.

Over the years the New Design for Old brief has changed and developed in order to stimulate and effect greater and greater change. From the first, rather hesitant 'consider products for older people...' we are now offering a more complex brief which encourages students from any area of design to explore their own field in relation to the scenario of changing demographics and social need. The RSA has made good use of its involvement with key European networks such as Design for Ageing Network (DAN) and the Gerontechnology Education Network in Europe (GENIE) and has also used the scheme as an exemplar of best practice to try and influence UK policy (Foresight Ageing Population Panel).

2003 will see significant changes to the RSA's Design programme. All its work will fall under four headline areas, one of which will be Citizenship. A new project arising from New Design for Old, called Inclusive Worlds, will be launched and this project will require students to work, preferably in multi-disciplinary teams or through consulting other disciplines, on key societal issues that demand an inclusive design response. Students will have a much longer time to develop and complete the project and entries from colleges across the EU will be encouraged. Inclusive Worlds will be supported by key organisations such as HHRC, ADAPT Trust, Age Concern, EIDD (European Institute for Design and Disability), Guide Dogs for the Blind Association and the new European e accessibility network – EDeAN. Inclusive design and accessibility issues will be firmly brought to the attention of students and tutors and eventually, it is hoped, that designing in an inclusive way will become mainstream and second nature to a new generation of designers.



Hugo Glover's 't-pot' 2001 winning entry, New Design for Old section.



The cover of the Strategies book illustrates users in the studio and the products created by the students.



The design-a-chair exercise at Kansas State University involved users of all ages, including a mother holding a child.

## United States

### **The Universal Design Education Project**

The Universal Design Education Project (UDEP) was developed by the Adaptive Environments Center in Boston, Massachusetts. It was planned in 1989 when the ADA was about to be signed, providing an opportunity to improve design education and student's ability to meet the needs of a diverse society. The approach was to infuse universal design into the curriculum of five design disciplines – architecture, industrial design, interior design, landscape architecture, and urban planning.

UDEP was initiated with a grant from the National Endowment for the Arts. It took two years before the project had enough funding to actually begin. Additional financial support came from NEC Foundation of America, the Disability Rights Section of the US Department of Justice, the Center for Universal Design along with private and corporate foundations.

The project was designed as a grass-root effort to support a range of teaching methods that grew out of the faculty and culture of each school. Inspired by Ray Lischke's work, the proposal requirements specified the involvement of people with disabilities and each school devised different ways to engage users in the teaching and learning process.

The first pilot project in the academic year 1993-94 was comprised of faculty teams from twenty-two schools across the country. Some were interdisciplinary, involving combinations of architecture, interior design, industrial design and landscape design. Others were stand-alone programmes in architecture, interior design, and landscape architecture. There were no proposals from urban design faculty. Many of the faculty selected through the competitive award process had strong experience in teaching accessible design. The initial pilot project is well documented in *Strategies for Teaching Universal Design* (Welch 1995).

There were several project components that supported faculty work. Members of the prestigious adviser group had partnerships with each of the schools. That contact included well-publicised visits to the schools, with lectures open to the public, meetings with administrators, and critiques of student work. Another generative element involved presentations by the faculty and project staff at the annual meetings of the related design societies. Annual project meetings facilitated the

growing faculty network. Faculty reported that the prestige of their awards was important in gaining more recognition by their colleagues.

The evaluations from the initial group of faculty said that the involvement of diverse users was the most valuable aspect of their teaching. They also reported attitudinal change in many students who expressed that universal design was the way they wanted to approach all of their work. The second pilot was in 1995-96 and included nine schools. Six of the schools from the first group used their experience to refine their programmes. They expanded the impact by involving more faculty and further infusing universal design in more studios and courses.

The programme has evolved into an informal network of educators around the world with a monthly online newsletter archived at [www.universaldesign.net](http://www.universaldesign.net). Educator forums sponsored by UDEP have been held at several international conferences. Many of the original faculty have continued to evolve their strategies to infuse universal design – some in different schools as they move on in their career.

The most well-embedded programmes are in the interior design programmes. There is now a discipline-wide commitment to universal design. FIDER (Foundation for Interior Design Education and Research), the accrediting organisation for interior design education programmes in North America, has incorporated universal design into their standards for accreditation (Jones, 2001).

There is little evidence of impact on other faculty in schools of architecture. There are 112 accredited architecture programmes in the USA, with long-standing and disparate educational traditions. There is still limited attention to user needs. There are continuing debates with little consensus on the degree of ‘practical’ experience that one should have in school and what should be reserved for the internship period. There is still confusion about universal design and its relationship to the Americans with Disabilities Act (ADA) Standards for Accessible Design. For many architectural educators and practitioners, universal design is merely a contemporary term for accessibility requirements or a code word for designing for older and disabled people. Since much of what is designed by architects is subject to the ADA, many architects feel that they know all about that.

In the summer of 2002, Adaptive Environments initiated planning with senior architecture faculty and the leadership of the Association of Collegiate Schools of Architecture (ASCA), to identify user-

**Students in this programme came to understand that ‘good design’ requires much more than compliance with the minimum requirements of laws that mandate a few special features to create barrier-free environments for individuals with disabilities**

oriented strategies that will influence teaching and learning. Strong recommendations from the group addressed the need to reach out to recent graduates – the younger architects who would be more likely to embrace the values of universal design and to link universal design with sustainable design. Overall, the United States is still in the early stages of the process to bring universal design into mainstream design education. The participants in the Universal Design Education Project continue in their contributions to universal design education knowledge development. Following is more detail on three of the schools that participated in the UDEP project.

### **Eastern Michigan University**

The Interior Design Education programme at Michigan State University (EMU) has infused universal design throughout its undergraduate programmes. Selected to participate in both cycles of the Universal Design Education Project in 1993/1994 and 1995/1996, the EMU faculty had a long history with the incorporation of accessibility codes into its programme. Louise Jones, D. Arch was the team leader.

When EMU was selected by the Adaptive Environments Center to be a participant in the first Universal Design Education Project (UDEP) in 1993, the programme was ready to move beyond teaching design for special needs and compliance with barrier-free regulations to teaching universal design as the appropriate underpinning for design decisions. (Jones, 2001)

EMU's first UDEP focused on two design studios, a fourth year interior design studio at EMU and one in industrial design at the University of Michigan. There was a range of user involvement strategies, including consultants representing many user groups. In response to the second UDEP request for proposals, the interior design faculty planned to make universal design precepts the foundation for interior design decisions. Tenure track faculty facilitated the infusion of universal design throughout the curriculum. Each of the eight semesters has a studio and one or more related lecture classes that are the prerequisites for the next semester. The advanced studios in the third and fourth years include complex projects with actual clients. Students address needs of diverse users in projects that may include residential design, historic

preservation and adaptive reuse of existing buildings and large-scale multi-storey, mixed-use buildings. By graduation, universal design is an integral component of most students' personal philosophies (Jones, 2001).

It's difficult for me to discuss universal design features, they are interwoven throughout the design...that's just the way I work.

(EMU student, 1996)

## **University at Buffalo Department of Architecture,**

The Department of Architecture, University at Buffalo, has a long and distinguished history in research, education, and practice of accessible design led by Professor Edward Steinfeld. Buffalo established their first research centre in 1984, and it became the Inclusive Design and Environmental Access (IDEA) Center in 1992. In 1999, the National Institute on Disability and Rehabilitation Research funded a new center for universal design at Buffalo.

Steinfeld and Abir Mullick were the lead faculty on the UDEP project, in 1993-94, and in 1995-96. Many of the strategies that they developed with other Buffalo colleagues in the UDEP years have been further refined and are now part of the curriculum. They include Designing for Diversity; a course offered for the first time in the spring of 2002 as part of the college's core requirements in General Education. Buffalo's 1996 UDEP panel on Designing for Diversity was instrumental in the creation of the course.

Other experiences include Computer Assisted Instruction (CAI), a computer-based course on the technical aspects of accessible design created to meet students' need for more technical comprehension. Students can work independently with this material, on their own schedule; Design for the Life Span, a course that presents an overview of the demographic trends, the major goals and approaches for design and planning of life-span needs, with special attention to children, older adults, and individuals with impairments; Master's Degree



Francesca Davenport is an Australian architect and included in *Building a World Fit for People*.

**The status of design education for an inclusive society is still largely dependent upon individuals**

Concentration in Inclusive Design prepares students to understand and respond to demographic trends and policy initiatives from both a theoretical and practical perspective, and to incorporate inclusive design principles with careers in general practice, facilities management and design research.

More examples of inclusive teaching at Buffalo can be found on the new Universal Design Education Online website at [www.udeducation.org](http://www.udeducation.org), a collaborative project with the Center for Universal Design and the Global Universal Design Educator's Network.

### **San Francisco State University Department of Design & Industry,**

The Product Design Program in the Department of Design & Industry (DAI) at San Francisco State University (SFSU) has been involved with universal design since 1990 when they collaborated in the Landscapes For All (LFA) Project, conjunction with Moore, Iacofano, Goltsman Inc. (MIG), Berkeley, California. They were awarded a Universal Design Education Project award in 1995. Building on earlier work, the programme incorporates sustainable and universal design along with a strong multi-cultural emphasis. The programme has continued to evolve, and has established a strong universal design presence within the university and the community. In presenting the programme to his colleagues, Project Director Ricardo Gomes describes the strong connections between the Product Design and Development Program and the various services, resources and environment at SFSU and the disability advocacy community in the Bay area (Gomes, 2001).

The Center's aim is to push beyond the esoteric values of the conventional product market to address through design, education and practice, the needs of an expanding global community. It seeks environmentally responsible and user-friendly solutions to the traditional global problems. The academic goals and objectives of the Center are to enhance the curriculum development in the DAI department, while stimulating the social awareness and responsibility of our students. These objectives have been accomplished through projects conducted in various design courses such as: Universal

Design Symposiums and Workshops; Design for the Environment Product Applications; User-Friendly Packaging Seminars, Design for Community Projects and Global Design and Cultural Identity.  
(Ricardo Gomes, IDSA Paper)

## Adaptive Environments Cente, Boston

### Access to design professions

Access to Design Professions is a project of the Adaptive Environments Center that encourages people with disabilities to become designers. The project is dedicated to Ron Mace, Fellow of the American Institute of Architects, and is supported in part by the National Endowment for the Arts and NEC Foundation of America. The project is built on the assumption that as people with disabilities enter the design professions, they will use their personal experiences to create more inclusive environments, products and information.

In order to learn more how we could attract and support designers with disabilities, Daniel Hunter, project researcher, interviewed thirty-three disabled designers around the world, to learn about their career development. Their stories about their lives, their challenges and their successes are guiding the project. To overcome the invisibility within their professions and to make younger people aware that design is a career option, the project published a book of profiles, called *Building a World Fit for People: Designers with Disabilities at Work*. The project includes an International Network, and a pilot e-mentoring programme. Information on how to get involved in the project is available at [www.adaptiveenvironments/accessdesign](http://www.adaptiveenvironments/accessdesign).

## Summary

Although change is in the air, and new programmes are developing around the world, not all of the examples have been institutionalised. The status of design education for an inclusive society is still largely dependent upon individuals with the notable exception of interior design education in North America. Although there have been a few systemic pilot programmes, their primary impact is a legacy of experience that informs and inspires other efforts. Therein, the knowledge continues to grow and is shared through publications, networking and promotional projects.

Universal Design: 17 Ways of Thinking (Christophersen, 2001) is a substantive compilation of efforts from four continents. A distance-learning programme in inclusive design offers undergraduate as well as graduate degrees at Salford University in the UK. The Centre for Education in the Built Environment recently supported the development of a Framework report to identify the contents and context for the teaching of 'inclusive design' in the UK. In February 2001, a European Council resolution recommended universal design education for all those involved in the built environment.

The resolution established an explicit goal that provides a context for innovative faculty. Following the resolution, two new programmes began: one in Belgium involving three architecture programmes, and Aaoutils, a European-wide programme involving several countries and a strong Internet presence. They, and those described in this chapter are making the foundations for our shared future.

## Acknowledgements

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Images courtesy of: Accessible Environments Center, Boston; Ruth Morrow, Chitse Ikeda, UDEP, Paul Durney, RSA.

# A design toolkit

# Understanding users

This section focuses on developing an understanding of a wider range of user capabilities, in order to help designers avoid inconsiderate design that excludes.

To start, Hua Dong, Simeon Keates and John Clarkson of the University of Cambridge examine the prevalence of functional impairment in Great Britain through relevant capability data – and assess the usefulness of such data in generating information for designers.

This overview is followed by Malcolm Johnston's discussion of an ability database that links health conditions to impairments and their consequent impact on activities. Through this exercise, Johnston looks in particular at the potential conflict between medical and social models of disability.

The two final chapters of this section explore how observational, ethnographic methods in design can capture the richness of the user experience. Judith Payling's discussion of a new perspective on understanding independence in older and disabled people is followed by Cherie Lebon, Mark Rouncefield and Steve Villier's espousal of such research techniques as triggers for innovation.

## Chapter 21

# The prevalence of functional impairment in Great Britain

**John Clarkson, Hua Dong, and Simeon Keates**  
University of Cambridge



The general lack of awareness of the wider range of end-user capabilities often results in inconsiderate design that excludes many users, especially older users and users with disabilities. There is a need for designers to understand both the nature and implications of the wider range of user capabilities to enable them to cater for diverse capability losses.

There are many sources of capability data available, each tailored for different purposes. As such, the capability data available often needs to be selected and synthesised carefully to be usable for design research. Traditionally, design research tends to focus on accommodating single, primarily major, capability losses. The reasons for this are two-fold.

First of all, single major impairments are often the most noticeable and therefore are the easiest to inspire the necessary motivation to address them. Second, such impairments are the easiest to understand and are comparatively easy to compensate for as there are no complex interactions with other capabilities.

However, many people do not just have one functional impairment, but several. This is especially true when considering older adults. Consequently there is a need to make designers aware of the prevalence of not only single, but multiple capability losses.

The aim of this chapter is to make use of the available multiple capability data for design research. A model of disability is described and two UK disability surveys are reviewed based on the model. The prevalence of disability in Great Britain is presented with illustrative analysis, and special emphasis is given to multiple capability losses. Finally, a comparison of different sources of data and an emphasis on further investigation on multiple losses of capability are presented.

**Many people do not just have one functional impairment, but several**

## A model of disability

Estimates of the prevalence of disability derived from any study depend on the purpose of the study and the methods used (Martin et al., 1988). Since disability has no 'scientific' or commonly agreed definition (Pfeiffer, 2002), a major problem lies in the confusion over terminology. However, the International Classification of Impairments Disabilities and Health (ICIDH) represents a rationalisation of the terminology frequently used. It identifies impairment, disability and handicap as consequences of diseases and presents a classification for each.

For example, disability is defined as:

any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being. (WHO, 2001)

This definition of disability has been used widely for both disability research (Martin et al., 1988; Grundy et al., 1999) and design research (Pirkle, 1994).

The model of disability (Figure 21.1) adopted in this chapter is based on the ICDIH definition of disability and the continuum version of disability, whereby the severity of capability loss ranges from very slight (category 1) to very severe (category 10).

It is worth noting that there is no absolute estimate of the number of disabled people in the UK because of the continuous nature of the concept of disability (Martin et al., 1988). The threshold above which people are classified as disabled will determine the number of people included. The positioning of the threshold between able-bodied and 'disabled' is essentially an arbitrary choice given the continuous nature of the range of population capabilities, but affects how many people are classified as falling into one category or the other.

## The disability surveys

The disability model shown in Figure 21.1 was adopted for the survey of disability in Great Britain in the 1980s (Martin et al., 1988) and for the 1996/97 Disability Follow-up (DFS) to the Family Resources Survey (Grundy et al., 1999).

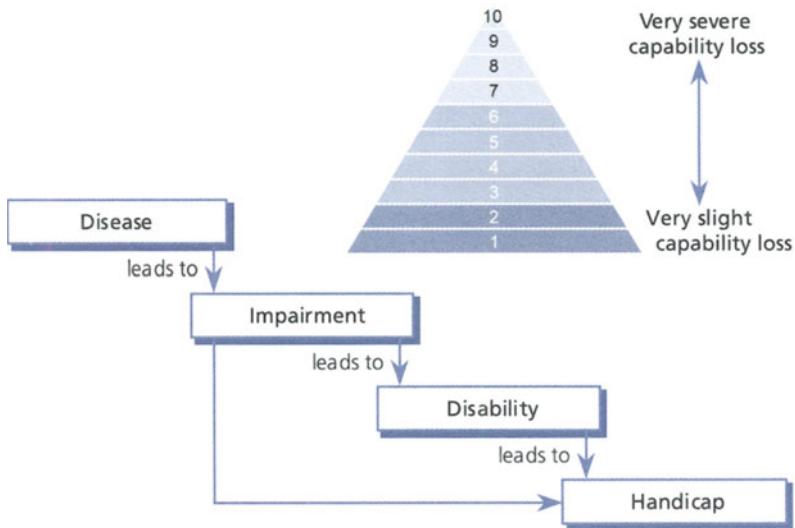
The following two sections briefly introduce the two surveys.

### The Survey of Disability in Great Britain

The survey of disability in Great Britain was carried out between 1985 and 1988. It aimed to provide up-to-date information about the number of disabled people in Britain with different levels of functional impairment severity and their domestic circumstances. The purpose of the survey was to provide information to allow the planning of welfare benefits and services provision.

The survey (Martin et al., 1988) used thirteen different types of disability (based on those distinguished in the ICDIH) and gave estimates of the numbers of adults with each type. It showed that

musculo-skeletal complaints, most notably arthritis, were the most commonly cited causes of disability among adults living in private households. Ear complaints, eye complaints and diseases of the circulatory system were also common. For those living in communal establishments mental complaints, particularly senile dementia, were mentioned most often, followed by musculo-skeletal (arthritis) and nervous system (strokes) complaints. The majority of adults, particularly the more severely disabled and almost all of those living in communal establishments, had more than one type of disability. The most common type was locomotion disabilities, followed by hearing and personal care disabilities.



### 21.1 A model of disability

After Benktzon and Martin et al.

An innovative feature of the survey was the construction of an overall weighted measure of severity of disability that can be used to classify people with different weighted combinations of disability. The criterion of overall severity was based on a consensus of assessments of people acting as judges, including doctors, physiotherapists, occupational therapists, psychologist, Department of Health staff and representatives of disabled people. In essence, the severity of disability in thirteen specified areas of disability is first established, and then the three highest of these thirteen separate scores are combined to give an overall score, from which people are allocated to one of ten overall severity categories.

**21.2 Weighted disability score.**

$$\text{worst} + 0.4 \text{ (second worst)} + 0.3 \text{ (third worst)}$$

This weighted sum is then translated into an overall severity category using the mapping shown in table 21.3. This measure was recommended by WHO (1996) and was used for the 1996/97 Disability Follow-up Survey.

| Capability loss   | Lowest | Moderate |        |        |        |         |          |          | Highest  |          |         |
|-------------------|--------|----------|--------|--------|--------|---------|----------|----------|----------|----------|---------|
| Disability score  | 0      | 0.5-2.95 | 3-4.95 | 5-6.95 | 7-8.95 | 9-10.95 | 11-12.95 | 13-14.95 | 15-16.95 | 17-18.95 | 19-21.4 |
| Severity category | 0      | 1        | 2      | 3      | 4      | 5       | 6        | 7        | 8        | 9        | 10      |

**21.3 Disability scores and severity categories.****The Disability Follow-up Survey**

The 1996/97 Disability Follow-up to the Family Resources Survey (Grundy et al 1999) was primarily designed to update information collected by the survey of disability in 1985-88 and to provide data on entitlement to state benefits. The results showed that an estimated 8 582 200 adults in Great Britain – 20% of the adult population – had a disability according to the definition used. 34% of these disabled people had severity scores of 1 or 2, indicating quite mild disability, 45% had severity scores in the range of 3-6 (moderate disability) and 21% had scores of 7 or more (severe disability). It was also found that 48% of the disabled population were aged 65 or older and 29% were aged 75 years or more.

In terms of the prevalence of disability, the predicted distribution for each capability would show the largest proportion of adults with little or no impairment of that capability. Fewer adults would exhibit moderate impairments and fewest would be severely impaired. For younger adults, the decrease from little/no impairment to severe impairment should be quite steep, whereas for older adults the distribution would be more evenly spread with a lower gradient. Looking at the data from the DFS, it can be seen that the *locomotion* capability follows the predicted distribution.

However, dexterity for example does not. The dexterity impairment distribution shows most people with no impairment, very few with minor (slight) impairment, then an increase for moderate impairment, and finally a decrease for severe impairment. The sudden jump from no impairment to moderate (severe) impairment appears at first sight to be confusing and contradicts many other data sources who typically follow

**Multiple impairments were more commonly found among older adults than among younger disabled people**

the predicted 'tail-off' distribution. The explanation for the discrepancy lies in the process of data collection.

The data for the DFS was gathered by interview, with the participants self-reporting any impairments. As such, no consistent measures of performance were used, simply the opinions of the participants of how difficult they found performing particular actions to be. Therefore, the accuracy of the data collected is dependent upon the level of self-awareness required to detect difficulties with the actions.

Locomotion difficulties are more noticeable because they often have a defined end goal, such as reaching the top of the stairs, or walking with someone else. As such, when someone's locomotion capability becomes reduced, it is more easy to recognise. The same applies for vision and hearing, which also follow the predicted distribution of severity from the DFS data.

Dexterity, however, degrades gradually over time, and there are no obvious measures of one's own dexterity performance. It is difficult to assess whether it is a little harder to pick something than it used to be, or if glass jar lids seems a bit tighter than it was a few years ago.

The above example illustrates the importance of addressing the process by which population capability data is collected. Only by knowing that the DFS was gathered by interview and self-reporting was it possible to understand and interpret the dexterity impairment data.

Age and gender variations were also found; the prevalence of more severe capability loss increased with age. Also with increasing age, the prevalence became higher among women than men. Multiple impairments were more commonly found among older adults than among younger disabled people. Communication, behavioural and intellectual function impairments were more common among those aged under 60 than among older adults. However, for moderate (score 3-6) severity, age variations were less marked than those for mild impairments.

**The results showed that an estimated 8 582 200 adults in Great Britain – 20% of the adult population – had a disability according to the definition used**

## The prevalence of capability losses

For inclusive design research, the range of user capabilities rather than disabilities is of most importance, because user/product interaction involves the match of functional demands made upon users by products and the capabilities the users exhibit. High capability demands from

the products and relevant capability losses among the end-users often account for design exclusion.

The disability severity scales adopted by the above surveys were adapted for research purposes, and seven capabilities closely related to product evaluation were selected. They are: *Locomotion* (13 points, with severity scores of 0.5-11.5); *Reaching and Stretching* (10 points, with severity scores of 1.0-9.5); *Dexterity* (11 points, with severity scales of 0.5-10.5); *Seeing* (9 points, with severity scores of 0.5-12.0); *Hearing* (8 points, with severity scores of 0.5-11.0); *Communication* (5 points, with severity scores 0.5-12.0), and *Intellectual functioning* (11 points, with severity scores of 1.0-13.0). The alignment of the severity scales allows for the combination of seven scores to give an overall severity category. This is derived in the survey report (Martin et al., 1988) as a weighted sum (Equation 21.2).

#### 21.4 Combined capability losses

Prevalence across the GB adult population (16+).

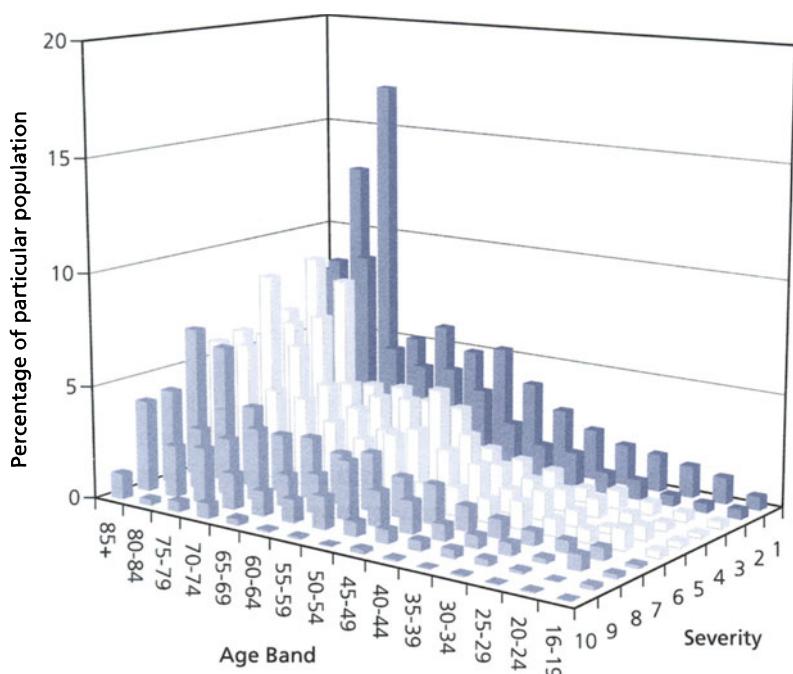
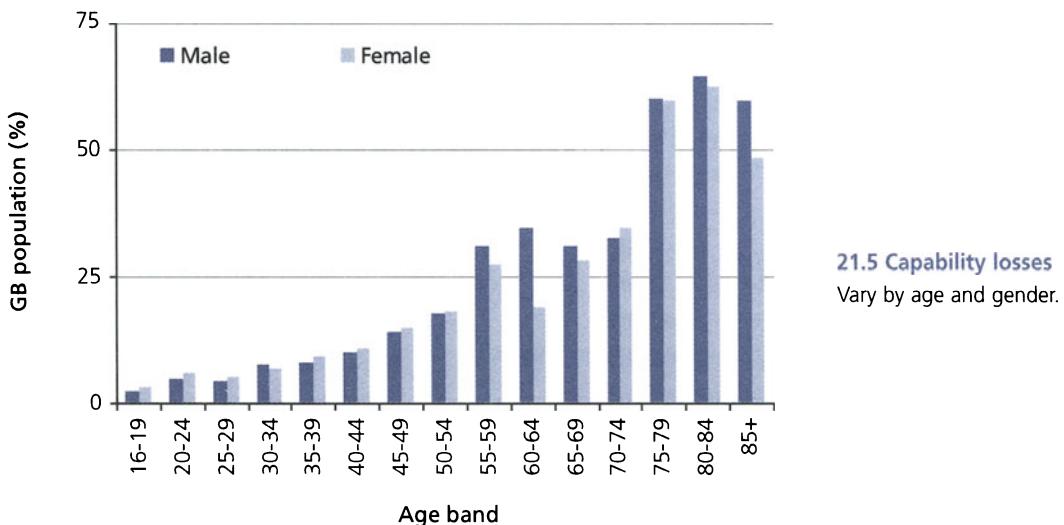


Figure 21.4 shows the overall capability segregated by age bands and severity levels (1-10 from slight to severe). It can be seen that frequency and severity of impairment increase with age.



### 21.5 Capability losses

Vary by age and gender.

Gender differences are shown in Figure 21.5. Overall, the prevalence of disability increases with age for both genders, as would be expected. However, there are noticeable deviations from this trend in the 55-64 and 75+ age bands for women and 60-69 and 75+ bands for men. The decrease in prevalence in both genders over the age of 75 is counter intuitive and is a result of the sampling procedure of the survey.

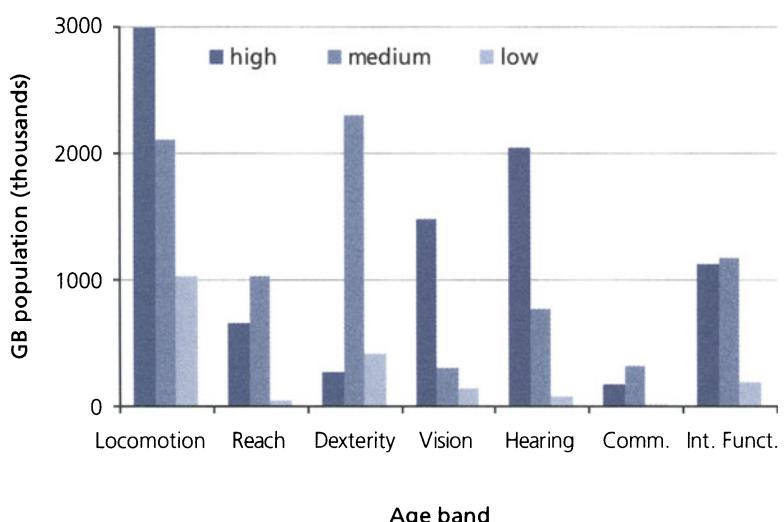
The survey was conducted with adults in domestic properties, not institutionalised care environments. As older adults develop increasingly severe impairments that make independent living more difficult, they are likely to move into retirement homes, thus removing themselves from the sample and biasing the results. The younger deviations in prevalence both coincide with the relevant retirement age (60 for women and 65 for men) and may be a result of the lifestyle change from the stress of working to the comparative relaxation of retirement. In addition to this, there is an underestimate of the disabilities among people of retirement age up to 75 years old (i.e. 60-75 for women, and 65-75 for men) due to the deficiency of the sample criterion.

Looking at the differences between the genders, there is little difference in prevalence between men and women up to the age of 55. After that, men are more likely to develop impairments, with the exception of ages 70-74, which may be just statistical noise as the samples decrease in size. The reason for the increased prevalence for men may be associated with their longer average working life.

Figure 21.6 shows the prevalence of individual capability losses for the 16+ age band. The most common loss of capability is that associated with locomotion, followed by dexterity and hearing. It is also evident that the loss of capability associated with vision and hearing is predominantly minor (score 1-2), whilst that associated with dexterity is moderate (score 3-6). These results are closely related to the questions used which defined the severity of different types of disabilities.

### 21.6 Prevalence of capability in GB

Ranges from high capability to low in the 16+ population.



### Multiple capability losses

The two disability surveys provided valuable information for analysing multiple capability losses, which are particularly important for design. Table 21.7 summarises the data extracted from the disability follow-up survey. The overall motion capability is derived from the *reach and stretch*, *locomotion*, and *dexterity* capabilities; the sensory capability is

### 21.7 Capability losses

Individual and multiple capability losses.

| Loss of capability type                   | Numbers of GB 16+ population | Percentage of GB 16+ population |
|---|------------------------------|---------------------------------|
| Mobility loss only                        | 2 915 000                    | 6.2%                            |
| Sensory loss only                         | 771 000                      | 1.6%                            |
| Cognition loss only                       | 431 000                      | 0.9%                            |
| Combination loss of motion and sensory    | 1 819 000                    | 3.9%                            |
| Combination loss of sensory and cognitive | 213 000                      | 0.5%                            |
| Combination loss of cognitive and motion  | 801 000                      | 1.7%                            |
| Loss of motion, sensory and cognitive     | 1 175 000                    | 2.5%                            |

| Loss of capability type                | Numbers of GB 16+ population | Percentage of GB 16+ population |
|--|------------------------------|---------------------------------|
| Some motion loss                       | 6 710 000                    | 14.3%                           |
| Some sensory loss                      | 3 979 000                    | 8.5%                            |
| Some cognitive loss                    | 2 622 000                    | 5.6%                            |
| Some motion, sensory or cognitive loss | 8 126 000                    | 17.3%                           |

derived from *seeing* and *hearing*; and the cognitive capability is derived from *communication* and *intellectual functioning*. It can be seen that there are high couplings of capability losses.

The distribution of combined capability losses can be seen in Figure 21.9 for the motion, sensory and cognitive capabilities. The bubble diagrams provide a direct summary of capability distribution. The area of each circle represents a percentage of 16+ age band. The percentages of couplings between each pair of capability losses are shown in the plot. It is evident that there is a high level of coupling (50%) between motion capability and sensory capability.

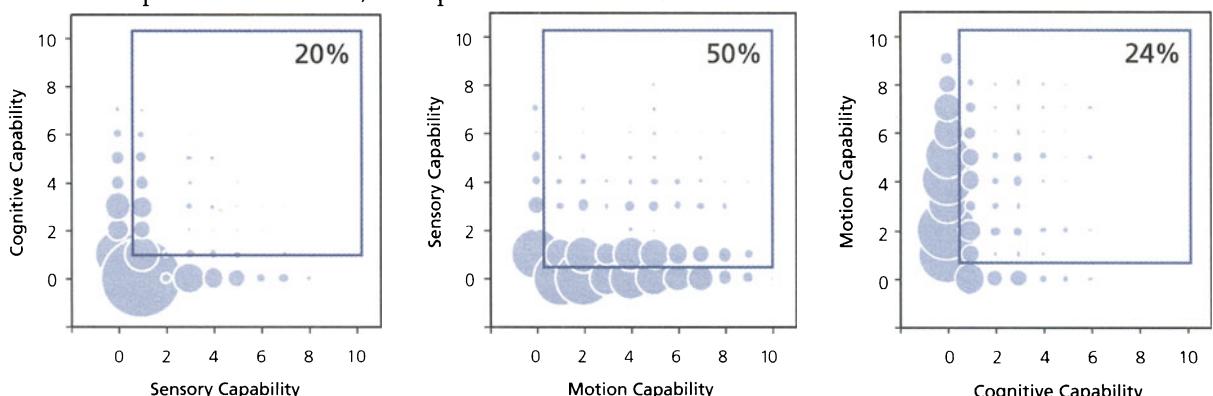
The implication of the distribution of multiple capability losses for design is that focusing on accommodating individual capability losses may not necessarily include everyone with that loss.

## Other sources of data

Disability/capability data generated by disability organisations may provide in-depth information for particular impairments. For example, the Royal National Institute for the Deaf (RNID) has data on deafness and the Royal National Institute for the Blind (RNIB) collects data on visual impairments. However, discrepancies are found from the

### 21.8 Capability losses

Individual and multiple capability losses in total.



### 21.9 Capability losses

The couplings between motion, sensory and cognitive capability losses.

**21.10 Hearing loss**

Statistics on deafness.  
(source: RNID factsheet).

| UK(1996)          | 16-60 years | 61-80 years | 81+ years |
|-------------------|-------------|-------------|-----------|
| Mild deafness     | 4.6%        | 28.1%       | 18.4%     |
| Moderate deafness | 1.6%        | 16.5%       | 57.9%     |
| Severe deafness   | 0.3%        | 2.3%        | 16.8%     |

**21.11 Hearing loss**

Data on hearing impairment.  
(source: GB Disability follow-up survey).

| UK(1996-97)         | 16-59 years | 60-79 years | 80+ years |
|---------------------|-------------|-------------|-----------|
| Mild impairment     | 1.8%        | 10.1%       | 20.6%     |
| Moderate impairment | 0.5%        | 4.2%        | 9.7%      |
| Severe impairment   | 0.1%        | 0.3%        | 0.8%      |

comparison of these data and the disability survey data. Tables 21.10 and 21.11, show the comparison of data on deafness.

As might be expected, the discrepancies are due to the differences of descriptions of mild, moderate and severe deafness and the data collection methods employed. The analysis of patterns of the couplings of multiple capability losses is promising to generate a platform for relating different sources of data.

**Focusing on end-user capabilities (what users can do) rather than disabilities (what users cannot do) offers designers clear parameters**

### Summary

The analysis of capability data generates useful information for designing for a wider range of user capabilities. However, different definitions of disability and data collection methods used for surveys often result in data that is not immediately comparable. Hence it is important to identify the purpose for which the data is required, the consequent nature of the data needed and thus the most appropriate data source. Even after this process, it may still be necessary to modify and adapt the data to meet the specific information need.

The prevalence of disabilities has highlighted the possible problematic areas for design. The common multiple capability losses present challenges as well as opportunities for design improvement, and should be investigated in depth.

Treating disability as a continuum raises awareness among designers, and society as a whole, that everyone has the material to be excluded from using a product at some point if the product has not been designed with sufficient consideration of the end-users.

**Focusing on end-user capabilities (what users can do) rather than disabilities (what users cannot do) offers designers clear parameters to**

design within, rather than the comparatively vague conditions causing the end-user disabilities. Consequently, focusing on specifying end-user capabilities is more useful for design research. Thus it is often most useful to interpret disability data not as a source of what users cannot do, but as a means of inferring what they *can* do.

## Acknowledgements

Chapter title image: multiple minor impairments, Ivan Coleman.

## Further reading

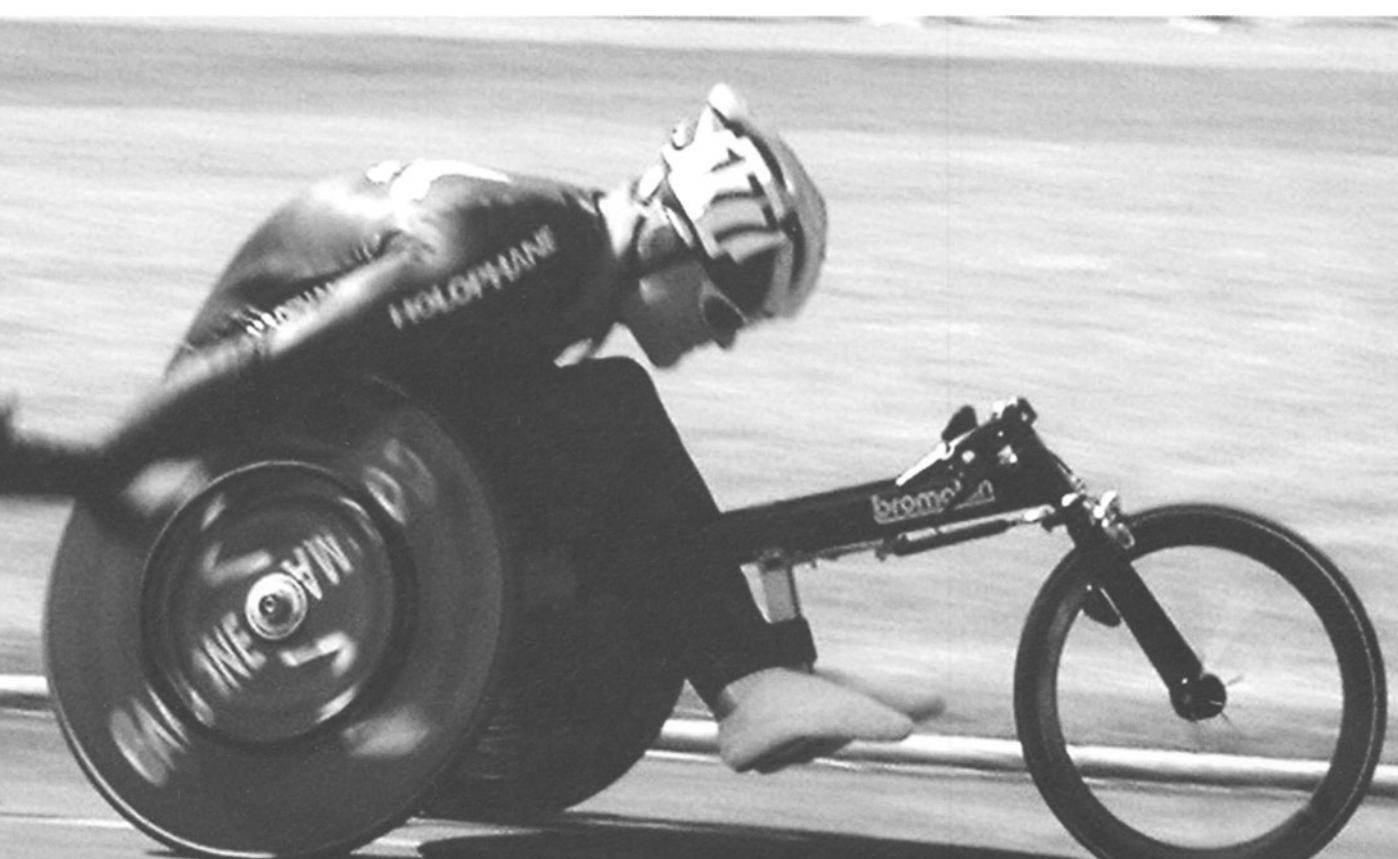
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## Chapter 22

# The ability database

**Malcolm Johnston**

The London Institute



This chapter looks at the potential conflict between the medical and social models of disability in the context of understanding impairments when designing for disabled people. It describes a database which links health conditions to impairments and their consequent impact on activities, and which utilises classification criteria from the World Health Organisation ‘International Classification of Function, Disability and Health (ICF)’. Quotations in italics are from the introduction to this work.

## Perceptions of disability

Product design can exclude groups of people in many ways, for reasons relating to religion, culture, education and aesthetics, but the simplest excluding factor to engage with is the functioning of mind and body.

We see disability as a departure from the usual, but there are no objective measures defining the line between ability and disability. The nearest thing to such a measure is the concept of ‘*percentiles*’ (percentages of populations whose members share a characteristic) when applied to measurements of human factors, which allow designers to meet the physical abilities of sections of the population.

When we cease to be able to do something, we become disabled, and age is the single most common disabler. Our physical and mental capacities deteriorate throughout life. But because age-related loss of function is inevitable, and affects everyone who grows old, we tend not to regard it as ‘disability’, reserving this word to describe loss of function not related to age. The consequence is that disability is seen as something to be feared, something we do not wish to be associated with ourselves and are embarrassed about in others. Hence while we may have a general understanding of age-related disability, we fail to understand its broader implications.

**There are no objective measures defining the line between ability and disability**

## The medical and social models

The way in which we understand and use the word ‘disability’ is revealing. For most of us it is associated with something ‘being wrong’ and hence with a medical condition, because we go to the doctor when something is wrong. As a result we see the failing as being in us – we are no longer ‘able-bodied’ or ‘of sound mind’. This so-called ‘medical model’ of disability has provided a context for developing products and services for disabled people who need assistance in living happy and

**The social model is concerned with how an individual's impairments affect their integration in society**

ordinary lives. It assumes that the individual must make adjustments to meet the norm.

However, there is another way of regarding disability. The 'social model' attributes it not to the individual but rather to a complex set of conditions, many created by social environment, which prevent the full integration of an individual into society. Society therefore becomes responsible for making environmental adjustments to allow individuals to participate fully in all areas of social life.

The social model is concerned with how an individual's impairments affect their integration in society, rather than with the medical condition causing disability, which is the primary focus of the medical model. Impairments are defined as '*problems in body function or structure such as significant deviation or loss*'. They result from health conditions such as disease, trauma, genetic disorder or birth defect.

## Inclusive design

The social model of disability gave rise to the principles of inclusive design. However, this approach to design in some ways involves reconciling the social and medical models. The designer must understand the relationships between health conditions and impairments, and between impairments and their impact on activity and participation '*problems an individual may experience in involvement in life situations*'.

As discussed in chapter 3 'Lifestyle, design and disability' individual disabled people want to engage in society in the same ways as anyone else. They are not defined by their medical condition but by their personalities and aspirations.

The aim of inclusive design is to create products that cater for a wider user base, including disabled people, so increasing participation and breaking down barriers. At the same time it maintains style content, appealing to the lifestyle aspirations of the whole target market.

## International Classification

The International Classification of Function, Disability and Health has provided important coding elements and stimulated contextual thinking for a new initiative relating to inclusive design, and the subject of this chapter: the Ability Database. As its name implies,

the classification provides a framework for the description of health and health-related states. Starting with descriptions of body function/structure and activity, it uses sets of qualifiers to describe, for example, the magnitude of impairments or difficulties in carrying out activities. It also classifies environmental factors (either individual, such as one's home, or societal, such as community systems) and personal factors (such as gender, race and lifestyle).

The ICF is based on an integration of the medical and social models: in order to capture the integration of the various perspectives of functioning, a 'biopsychosocial' approach is used. Thus, ICF attempts to achieve a synthesis, in order to provide a coherent view of different perspectives of health from a biological, individual and social perspective.

**The Ability Database works by integrating the medical and social models**

So the ICF creates a continuum of classification, from impairment to individual to activity and participation. Being defined as '*involvement in a life situation*', participation embraces individual and social activity.

## The Ability Database

Those working on inclusive design often need advice from medical professionals, and so they are exposed to medical terminology. Diagnosis lies at the core of medical communication, and the terminology used embraces both medical condition and impairment without distinction. The need for a tool to enable medically untrained designers (the majority) to understand medical knowledge in a useful way was apparent. Researchers within the London Institute at Central Saint Martin's College of Art and Design have therefore built on elements of the ICF to design a database linking the medical diagnosis of health conditions with impairments and with participation in activities.

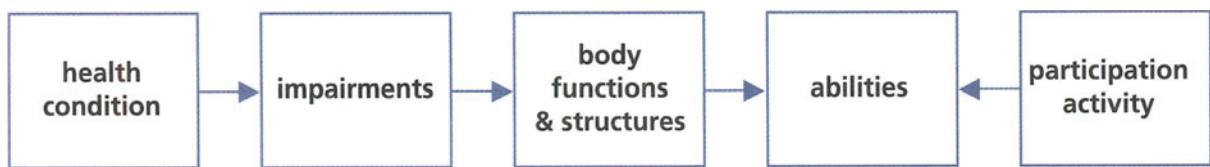
There is a paradox in creating a tool with a medical base to support inclusive design, which is predicated on the social model of disability. But, like the ICF, the Ability Database works by integrating the medical and social models. And because it facilitates the design of products that help disabled people participate more fully, and that do not stigmatise people as 'different', the database can play its part in changing attitudes.

The Ability Database links a health condition to a participation activity via three primary variables – impairments, body structures

and functions, and abilities – and a secondary variable indicating the degree of an impairment. The database can also work in reverse, linking activities back to the impairments and conditions that might affect someone's ability to participate.

## 22.1 Core elements of the database.

## Elements, terminology and classification



### Health Conditions

The International Statistical Classification of Diseases and Related Health Problems (ICD-10), which provides an internationally accepted standard, was used in defining health-condition descriptors and codes. The scope of the Ability Database is defined by the needs of its intended user base – product designers in developed countries – so only a small percentage of ICD-10 is applicable. However, the terminology and underlying coding used provides robust consistency.

### Impairments

Impairment descriptors are problematic. An impairment is defined as a '*problem in body function or structure such as significant deviation or loss*' and hence a descriptor will usually be linked with a body part. The database establishes such links, but the purpose of the impairment name in our context is to give a simple English description that people without medical training can understand, and that also identifies features that different health conditions have in common. Although the descriptors often include the name of a body part, they rarely duplicate the body function and structure entries, which provide more specific details of one or more body parts.

Medical terminology for the impairments descriptors are gathered from ICF and ICD-10 descriptions (e.g. 'frozen joints', 'weak muscles', 'muscle spasticity', 'involuntary movements', 'pins and needles') and from secondary sources including some common usage terms. An impairment may affect one ability or several.

## Body functions and structures

Body functions are the ‘physiological functions of body systems (including psychological functions)’ and structures are the ‘anatomical parts of the body such as organs, limbs or their components’. The ICF system, which provides classification within chapters organised according to body systems, has been adopted:

| <b>Chapter</b> | <b>Body Functions</b>  | <b>Body Structures</b>  |
|----------------|--|---|
| 1              | Mental functions   | Structures of the nervous system  |
| 2              | Sensory functions and pain   | The eye, ear and related structures                                     |
| 3              | Voice and speech functions   | Structures involved in voice and speech                                 |
| 4              | Functions of the cardiovascular, haematological, immunological and respiratory systems | Structures of the cardiovascular, immunological and respiratory systems |
| 5              | Functions of the digestive, metabolic and endocrine systems                            | Structures related to the digestive, metabolic and endocrine systems    |
| 6              | Genitourinary and reproductive functions   | Structures related to the genitourinary and reproductive systems        |
| 7              | Neuromusculoskeletal and movement-related functions                                    | Structures related to movement  |
| 8              | Functions of the skin and related structures   | Skin and related structures   |

Up to three levels of classification are provided in each chapter, for example:

### 22.2 Example classification levels.

Body functions 7: neuromusculoskeletal and movement-related functions

- Muscle Functions (code b730-749)
- Muscle power functions (b730)
- Power of muscles of one limb (b7301)

Body structures 7: structures related to movement

- Structure of upper extremity (s730)
- Structure of hand (s7302)
- Muscles of hand (s73022)

The two examples (Table 22.3, overleaf) illustrate impairments resulting from two common health conditions. The ICD-10 and ICF codes are shown and associated body structures included where appropriate.

| <b>Health Condition</b>  | <b>Impairment (code)</b>  | <b>Body structure (code)</b>   |
|--|---|--|
| <b>Rheumatoid Arthritis</b>  |   |  |
| m05 seropositive,<br>m06 other RA  | Neck pain (b28010)<br>Upper limb pain (b28014)<br>Lower limb pain (b28015)<br>Back pain (b28013)<br>Jaw pain (b28010)<br>Generalised pain (b2800)<br>Depression (b198)<br>Generalised weakness (b7309)<br>Sleep disturbance (b1342)<br>Joint stiffness (b7109)<br>Anxiety (b152)<br>General exhaustion (b1300)<br>Abnormal gait/walking pattern (b770)<br>Pins and needles in hands (b279)<br>Pins and needles in feet (b279)<br>Unstable balance (b2351)<br>Fatigue (b4552)<br>Weak grip (b7309)<br>Reduced dexterity/hand stiffness (b7108) | Neck (s7102)<br>Upper limb (s730)<br>Lower limb (s750)<br>Back (s7608)<br>Face (s7101) |
| (s73021)   | Visual acuity reduced (b2100)<br>Generalised joint stiffness (b7102)  | Hands (s7302)<br>Feet (s7502)  |
|  |   | Hand muscles (s7302)<br>Joints of hand/fingers   |
| <b>Heart Attack</b>  |   |  |
| I21 acute,<br>I22 subsequent,<br>I23 complications<br>following acute<br>attacks | Chest pain (b28011)<br>Reduced exercise tolerance (4559)<br>Depression (b198)<br>Movement disability e.g. walking, bending<br>over, climbing stairs (b799)<br>Unstable balance (b2351)<br>Reduced general physical endurance (b4550)<br>Jaw pain (b28010)<br>Upper limb pain (b28014)<br>Back pain (b28013)<br>Breathlessness (b4408)<br>Fainting episodes (b1101)<br>Memory impairment (b144)<br>Sleep disturbance (b1342)<br>Depression (b198)<br>Feelings of being disabled (b1801)  | Chest (s7609)<br><br>Face (s7101)<br>Upper limb (s730)<br>Back (s7608)                 |
| 22.3 Impairments resulting<br>from two common health                             |   |  |

## Abilities

The term 'ability' has been adopted to describe the elements (e.g. 'grip', 'lift') that constitute an activity (e.g. 'drink', 'carry'). A set of abilities is required to carry out an activity.

The abilities act as the links between the medical and the social components of the database. They allow a designer to investigate the

implications of a design decision on a participation activity and at the same time to see the body functions and structures involved, and hence the extent to which a design change can compensate for an impairment.

The ICF descriptions provide some descriptors for abilities but most have been gathered from secondary sources or are common terms. In deciding what should constitute an ability, it is essential that the definition is not so broad that a lay person cannot understand its scope, and not so detailed that a single activity requires a host of different abilities.

For example, drinking requires the abilities of reaching, gripping, lifting, and tipping, which must be applied with sufficient strength and minimal tremor. From a medical perspective, lifting, for example, would involve further 'sub'-abilities such as the functions of muscles and joints. This detail of analysis has been judged too great for the needs of most designers and too time-consuming to build into the database. A common-sense approach, informed by an understanding of design methods, has been adopted. As a result, the number of body functions and structures involved in a single ability will vary significantly.

## Participation activities

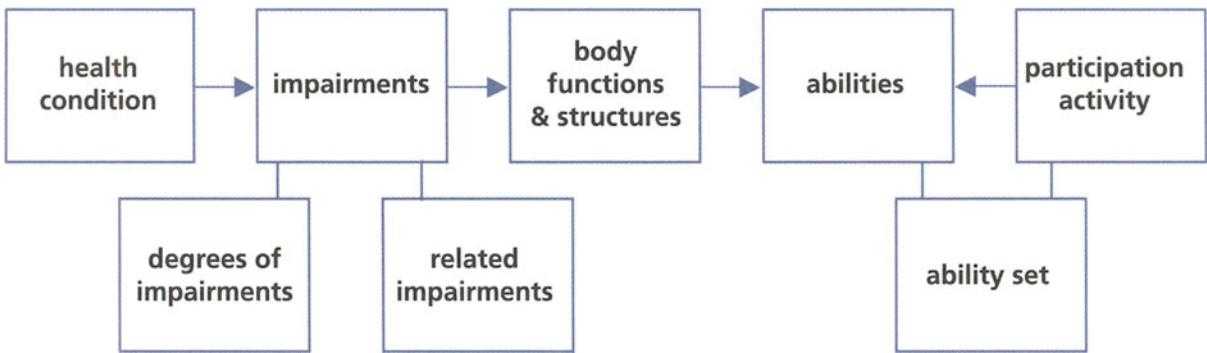
The potential range of activities is more or less infinite. The database entries will therefore be limited to exemplars, which cover a spectrum of typical living activities and to this end a standard set of Activities of Daily Living will be adopted. Designers are skilled at understanding human/machine interface issues and will use the examples to help them identify the abilities appropriate to a design brief. ICF codings will be adopted to classify these activities.

## Additional elements

The basic database model requires three additional elements – degrees of impairments, related impairments, and ability sets – to complete it.

## Degrees of impairments

It is to be expected that the degree of an impairment will vary between individuals. However, in the context of a given health condition, it may be the case that one or more of the consequent impairments will



#### 22.4 The complete database model

typically appear at a known level of severity, and the database allows for this to be recorded.

### Related impairments

While the purpose of the database is to define impairments consequent to a particular health condition, there are often known links between some of these impairments in different presentations of the health condition. This information is of great value to the designer.

### Ability sets

Each activity is made up of a set of abilities in the database, which allows links to be made between the two elements.

### Applications and developments

The Ability Database will provide a tool that relates medical terminology to people's experience of disability and allows designers to identify functional links across a wide range of impairments. It will be possible to answer questions such as:

- What other health conditions produce this impairment?
- Which abilities are affected by this impairment?
- Which activities require this ability?
- Which health conditions most impact on this activity?

Resources to date allow the database to be populated with impairment and body-structure information on some 40 health conditions. This represents a good coverage of the conditions most likely to produce impairments that impact on a designer's work and forms a valuable

basic tool. The next stage of work will involve adding activities and their associated abilities and linking these to the impairments.

A valuable future development will be to include numerical data on the frequency of impairment resulting from each health condition. This information will greatly assist in creating opportunities for inclusive design as well as identifying the market potential for new product development. However, extensive UK-based research has shown that there is currently a lack of relevant data with sufficient detail. The scale of a project to acquire this information will be large, and identifying an appropriate methodology will be an exciting challenge.

## Acknowledgements

Chapter title image: KP Kirby racing wheelchair, courtesy Peter Carruthers.

## Further reading

For a list of WHO publications, including the International Classification of Function, Disability and Health (ICF), and the International Statistical Classification of Diseases and Related Health Problems (ICD-10), visit [www.who.int/dsa/disease8.htm](http://www.who.int/dsa/disease8.htm)

## Chapter 23

# The sense of independence

Judith Payling  
The Dare Foundation



This chapter discusses the factors that contribute to a person's sense of being an independent individual who can engage in meaningful relationships and participate in their local community. It focuses on the personal accounts and experiences of disabled and older people in terms of maintaining their independence.

## **Whose independence is it anyway?**

No one person can define independence for another. However there seems to be a range of constituents upon which the majority of people agree. A growing body of evidence indicates that older people do not define independence in terms of functional abilities (Johnson in Bond et al 1993, Godfrey & Callaghan 2000, Velde & Fidler 2000). Studies focus more upon the capacity to maintain an interdependence with family, friends and others and the ability to retain involvement in aspects of their lives which have always been important to them.

Younger people too have expressed how independent living is about access and participation in ordinary activities, not those presented as 'special'. They need unfettered access to schools, jobs, transport, houses, leisure, and so on: all the things that non-disabled people take for granted and expect to be well designed, aesthetically pleasing and fit for purpose.

Fincham (2000), speaking at a conference about inclusion, drew upon her personal experience when she said "independence is a personal construct: disabled people are expected to make do with half right solutions and be grateful". Murray reported to the Joseph Rowntree Foundation (JRF) on experiences of disabled teenagers, demonstrating how the presence of appropriate support allowed them to embark on new activities. Young people felt this did not compromise their independence as they wanted "an opportunity to stretch themselves to their limits - whatever those limits happen to be" (Murray, 2002).

However a more general perception was that, because they were not taking part in these activities without support, they were not independent - nor were they benefiting from the experience. This erroneous perception of dependence by non-disabled people often denies disabled people the opportunity to take part in everyday life (chapter 4, Disability unplugged).

This creates an ideology of independence which maintains that, if you receive help from another because you are older or disabled, then you must be incompetent and have low expectations of yourself and others. Therefore it is necessary for the state to intervene, to support you to be 'independent'.

In order to gain a better understanding of these issues, the i~design project team partners approached the Dare Foundation to organise a series of focus groups and interviews to explore people's personal views of what was important to their sense of independence. The make-up of the focus groups ensured a cross-section of older and disabled people of differing socio-economic, educational and regional backgrounds. The interviews provided an opportunity for dialogue between the researcher and the participants, allowing a deeper exploration of the nature of independence and the way it influences relationships between disabled and non-disabled people.

### Meeting people, gaining views

Two different focus groups discussed the concept of independence with an independent facilitator over a couple of hours, with the researcher silently observing. Participants were drawn from a wide variety of backgrounds and all of them had direct experience of disability or of caring for someone with a disability. Some had direct experience of both; this was particularly true of some of the older participants.



In-depth interviews were also carried with four individuals who did not participate in the groups. Disability Unplugged (see Chapter 4) is a record of two of these people and a further interview was carried out with two people in their eighties. The interviews and the focus groups were unstructured. People were asked to reflect upon the meaning of 'independence' and what gave them a sense of independence in their everyday lives. It was made clear that they were not required to discuss the impact of income and cost, or the physical environment, as other studies have previously explored these issues.

By way of introduction, a definition of independence was given from the Oxford English Dictionary. Throughout the study the researcher kept a diary. This proved fruitful ground when interpreting of the findings and comparing the experience of disabled and non-disabled people. Qualitative data is a good starting point for investigating the relationship between the lived experience of disabled

people and the theoretical understanding of others exploring solutions to the perceived 'problems' of socially-excluded individuals.

It was decided at the outset that the researcher would not act as an 'expert researcher' and 'use' the experience of disabled people to arrive at solutions on their behalf. It was important to present the views of the participants in their own voices. Therefore, wherever possible, the words of the participants are unmediated.

Irving Zola, medical sociologist and disability activist, talked about his own experience of living with impairments due to polio and a later road accident: "The striving for independence is a ...hallmark of the rehabilitation literature. But ....the key seems to be who is defining what is independent. In my personal life space, the issue has most clearly surfaced in regard to wheelchair use. Most people with mobility problems have had to face the increased physical difficulty...We had to overcome much reluctance, fear and even pain to use our muscles while our arms, legs, and even heads rebelled. And once we could reach certain physical goals ...we must always do them in order to maintain our strength and independence.

*"I was always told to push myself to the maximum of my physical capability... For me, this meant travelling just like everyone else. I would park my car and walk the full distance to wherever it was that I wanted to go, even in winter on icy sidewalks. No matter that it took me five times as long to get there or that I arrived at my destination cramped and exhausted. The important thing was I got there on my own strength ...*

But the price I paid was a high one. After a while fewer and fewer people wished to walk at my pace. Thus, either through my embarrassment or theirs, I eventually went earlier or alone or not at all. In the middle period of my life until my late 30s, this meant I omitted many activities that required considerable walking or where my slowness impeded the activity. Specifically, I stopped going on tours visiting museums, or attending large public events. I occasionally mentioned this to my varying orthopaedists and prosthetists. They in turn only shook their heads in sad acknowledgement. None of them ever suggested that I use a wheelchair. By living according to someone else's



Rehabilitation in a real-world setting, an 'Independence Square' installation by Guynes Design.

definition of physical independence, I contributed to the demise of my own social and psychological independence." (Zola, 1982)

By all accounts Zola's experience is not uncommon for disabled people and it challenges non-disabled people to think carefully about what is required to ensure independence is respected.

### Defining independence

Independence represents different things to different people. Many personal testaments of disabled people document their journey to 'independence' and defend their position as advocates of a 'return' to, or achievement of, an independent life. Much is written in health and social care publications about the need to enable disabled and elderly people to become independent. These focus in particular on those activities of daily living for which statutory state support is available.

This emphasis on independence seems to reflect a need to determine the levels of 'special' services a person requires to remain in their own home. This study however, is not primarily concerned with those people who need extensive rehabilitation and a whole range of assistive technology to pursue their lives. It is concerned with people who live happily in their own homes, go about their everyday lives in a local community, work in ordinary jobs and participate in a range of leisure activities. Some of the participants use the support provided by their local authority for their basic personal care needs. They did not report that this affected their feelings of independence, or otherwise.

Through the study it became clear that the understanding of independence was very subjective and also alters during the experience of disability. For those people with an acquired disability, their experience fell into two phases. The first was a time during which they strove to get better. They worked with therapists and clinicians to improve physical prowess and their ability to manage personal care; they sought to restore balance to their life after a devastating event, to return to a state of being that they had enjoyed prior to this event monopolised their thoughts, and all of their efforts were directed towards this. One participant reported:

"I went to a place three times a week for specialist exercise and once a week for hydrotherapy".



Therapy was seen as vital and every activity was viewed as having potential to improve capacity and capability. It appears, however, that there is a point of transition when someone begins to recognise that the quality of their life is important and that the focus on their health condition is no longer as productive as it once was. With this recognition comes a shift towards seeking products and services which are not to do with rehabilitation, illness and vulnerability. The issues that emerge are about lifestyle, expectations and interdependency and their role in providing a sense of independence.

People whose capacity gradually decreased due to old age also report a shying away from specially-designed 'disability products and services'. They expect to continue purchasing and using the same products and services they have always used but want these to take account of their changing needs. As one 85 year old said:

" I want the same as I wanted at the age of 25 but I need it to be designed thoughtfully to take account of my decreased faculties and staying power."

Another interviewee talked about wanting things that gave her the same standard of life despite the fact she demanded more because of her reduced capacity:

"I want a walking frame designed by Conran."

In her study about disability products, Barber (1997) identified that such items are "more likely to reflect the pre-conceptions and corresponding fears of the non-disabled designer". Other participants who had been disabled all their lives did not mention the range of activities that have traditionally been associated with independence, such as mobility, personal care tasks, communication and household management, although they did all talk about work. They expressed the view that the focus of society, government and professionals upon on an individual's physical capacity, and on a small range of activities of daily living, was detrimental to their quality of life. Their implication was that society's requirement for disabled and elderly people to be independent amounted to oppression.

This theme recurred throughout the focus groups and the interviews. Independence was about being able to depend on others and on having dependable services. The participants talked about how much they depended on these three aspects so that they could fulfil their ambition to be unpredictable and individual in their own actions. A sign, they felt, of true independence. This suggests a rather more complex view of independence and one that matches with the social model of disability.

### Key elements of independence

The sense of independence appears to be defined by engagement in the five following categories:

- Maintaining roles and relationships with others.
- Contributing to the welfare of others.
- Engaging in leisure/activities which are fun.
- Managing life including work.
- Taking risks.
- Maintaining roles and relationships with others.

Other researchers (Johnson in Bond et al., 1993, Godfrey & Callaghan, 2000) have argued that interaction between people is a significant source of satisfaction in older people and contributes to their experience of well-being and self perception of independence. The focus groups concurred with this view but showed it was important to people of all ages.

There was a sense that all the participants used their roles to give shape to their lives and to measure themselves against their contemporaries in this respect. Some quotes from the focus groups help illustrate this point:

“We need to have shared experiences to maintain relationships”

“My role as a grandparent is very important to me, I wanted my independence so I could tangle with them (my four granddaughters) again and throw them up in the air....”

“All my contemporaries are doing new things and I don’t want to get left behind because they are moving off and having



different experiences”

“Music, keyboards and nights out with friends, meeting girls are my son’s main interests”

“It is nice for me to feel that I am still useful because that is very important - to be needed, now that they (the grandchildren) are old enough they can get my wheelchair and put it into the car and help me transfer. Then I can drive them out places, for instance to the football or to swimming”

“I think it is important to consider what other people feel about things as well. You can’t tell people, even your sister, to do things all the time. They need to have some time when they can say ‘No, I’ll do it later’”

Communication was a critical factor for the maintenance of relationships. This can be difficult on many levels, most obviously when an impairment prevents someone from speaking or hearing. Other less obvious factors were the need to express opinions and ideas about external events, especially those unrelated to one’s own particular circumstances. One participant described how, since his wife became disabled, others thought the couple’s only topic of conversation was the impact of this disability on their lives. He felt he had

“disappeared as a person”.

However, time spent alone was deemed very important. This is corroborated by Vasey (1996) – “Independence is about privacy and space for solitary activities and personal relationships” – and also by Pete Zein (Disability Unplugged, Chapter 4). Further, being able to switch off from either caring responsibilities or the daily environmental challenge was seen as crucial. One participant liked to go off to her caravan where she could just relax and not have to

“constantly relate to new situations”.

Others in the focus groups talked about very simple things which made a difference and enabled them to carry on in sometimes quite difficult relationships. These included:



“going for a walk, a real walk of 40 miles on my own”

“being in the garden”

“going on holiday”

“being in wide open spaces”

“swimming in the sea”

“an opportunity to be alone with my husband”

and for one carer going to the weekly coffee morning at her local church as it gives her

“free time and company”.

For one man in the group, a local British Legion club had become his ‘life’, though he is unable to go on the club’s frequent outings because the coach cannot accommodate his wheelchair. This demonstrates that being part of something might be just as important as being able to participate in all the activities. For him it was a recognition of his war-time experience which enabled him to maintain a sense of being independent despite his obvious impairments.

Another strong element that emerged was the desire to look good. One older woman described how it was really important to her to keep dressing well as she always had done; she talked about always putting on her make up and presenting a positive face to the world.

“It gives me more energy.”

She reported. There was much discussion in one group about purchasing clothes and make up, the problems these presented and the way disabled and older people are treated in shops. People said:

"Who is this perfect person, who fits into size 10 or 12?"

"They always think you want 'frumpy' shoes. I use a wheelchair, I don't weight-bear and I love shoes with really high heels"

"Doing up my bra is so difficult with one hand, and I know lots of older people don't wear one but I've always been proud of my figure and I like to feel I can still attract attention"

"I tend to wear clothes that do up down the front because I can take them off without flailing arms everywhere because people then notice less"

"I really like to pamper myself, have my nails painted, and a long hot soak in the bath and use lots of skin cream to keep my skin soft and supple"

"I have lots of problems with make-up: square lipsticks are really difficult if you have dexterity problems, several well known brands have just introduced this design, so now I can't use them"

"Another really big problem is sanitary towels. I can't use tampons because of my dexterity problems. I like the ones with loops and tapes. Boots used to make them, now they don't. Dr Whites did but now only the stick-on ones are available. These are not suitable if, like me, you sit in a wheelchair all day. It is a difficult subject to discuss but very necessary, I now have to wear an incontinence pad which is very bulky and less convenient to dispose of".

Many of these problems create very real barriers to a woman as she seeks to create a positive image of herself. There was a strong feeling that 'fashion buyers' do not perceive disabled people as potential customers, having assumed that this group of clientele are not interested in wearing fashionable and smart clothing. This, it was felt, may be linked to an assumption that disabled people do not work and do not participate in the same range of activities, such as sport and outdoor pursuits, as their non-disabled contemporaries.



RCA Fashion and Textiles student  
Rebecca Patterson designed a range of  
stylish, wheelchair-friendly clothing for  
her sister Susanna.

Interior features present further problems: changing rooms are too small if you need assistance; mirrors are in the wrong position; aisles are too narrow; in supermarkets, additional stock baskets are frequently positioned in pedestrian space making it more difficult to move round with any kind of dignity.

There was also a desire to maintain physical proximity to others. This was talked about at considerable length by grandparents in the group, not in the context of an intimate relationship but in relation to physical contact between friends and relatives. For some members of the group it was the chance to have a rough and tumble with grandchildren which had been compromised by their impairment; for others it was products they used, such as a wheelchair, that impeded close contact.

One 85 year old woman noted that she had been saddened, when her sleep had become so disturbed by the pain she experienced after a stroke, that she felt unable to share a double bed with her husband any more. Her use of a wheelchair created further complications and barriers. Limited space in their house meant that she moved to a downstairs room, a situation only alleviated by the installation of an intercom so that they could keep in touch through the night.

### Contributing to the welfare of others

Social networks and relationships with family and friends constituted a major factor in the participants' sense of independence and of well-being. These relationships were not simply about family affection and friendship; they provided opportunities to make a contribution to other people's welfare. Participants perceived their need to be dependable in relationship to others, that their part in this relationship was to provide support to others through their work role, or as a partner, as a grandparent, as a volunteer. One participant said:

"It is so important to be able to do things for other people as well as for yourself. It is a reciprocal thing - like with the family, going to watch a football match - people can help you in and out of the car with the wheelchair but you are going to be the one doing the driving, so you are helping them by actually driving them there, that feels very good."

However, when these networks and reciprocal arrangements broke down, negative feelings such as anger, frustration and sadness emerged. In turn these reduced self esteem and ultimately the sense of independence. Two instances illustrate this: A mother felt isolated from her spiritual community because she was so involved looking after her son, she had little time to visit the temple and take part in activities there. She would have liked to take her son to the Sikh temple but she felt ignored and believed that people did not want to listen to her.

One of the younger participants had been injured in a major road traffic accident and explained how he has become increasingly isolated. His friends have gradually stopped seeing him, he lacks concentration, cannot find work and does not feel engaged with his community. He would like to drive but it is not safe for him to do so. He would like to do more but feels trapped in a circle of disability-orientated services and is bored and unchallenged by their lack of demand on his abilities. He struggled when asked to define what independence means to him. He feels that work would give people a reason to value something that he does.

More positively, other participants talked about ways in which their contribution was important. Three participants talked about being able to do DIY around their homes. This they felt was a task that both helped the family but also 'maintained their independence of expensive tradesmen'. They also felt this occupation supported their role within the household giving another perspective on independence. This was echoed by other participants:

"I wanted to drive so I can be independent of our horrendous transport services and make sure my family are too."

There was general agreement that reciprocal action could often be quite small but it really made a difference to how they felt. This is illustrated by the following statement:

"I get very chuffed now when my wife asks me to open a stiff jam jar because I can do it and she can't. A small thing like that makes me feel independent."



RCA Industrial Design Engineering graduate Matthew White worked with older users on lightweight power tools for home repairs and improvement.

Another person talked about how she was  
“really looking forward to be able to use the washing machine  
again”

so she could help with the daily chores. It is interesting to observe how mundane the activities seemed to be which made a difference to people.

### Engaging in activities which are fun

Maintaining balance in their lives gave participants a sense of being actively involved in life, not passive onlookers. Leisure activities seemed to fulfil four main purposes:

Firstly, to replace a previously valued activity such as a sport. One man said:

“I used to be a fair squash player, but since my stroke I can’t play. I have found a replacement for it. Rather than say I can’t play squash now, I found out that I can go to the local gym, and I go three times a week, I’ve been rowing and I found that rowing became my new ‘squash’ and it is a challenge to be against the machine”.

He went on:

“I am prepared to accept I can no longer play squash. I am gradually replacing it with these other activities which fulfil the competitive need that remains within me thus retaining self respect which is an important ingredient in one’s sense of independence “.

Secondly, to provide the opportunity to do something different and develop dormant skills and interests:

“I’d really like to draw and paint. I want to discover something new – a new talent perhaps.”

Thirdly, as illustrated by an older interviewee, to develop a different aspect of a previous activity:



Wheelchair-friendly kitchen by ALWO GmbH.

"I can't play the piano very well since I had my stroke but am having great fun learning to compose music. I am writing a piece for a full orchestra – it is quite a challenge but totally absorbing"

Fourthly, to provide structure and purpose to the day. As one of the younger participants said:

"I'm really into computers – computerised art and graphic design. I do get tired and am a perfectionist but I create banners and other material for a local charity. It helps pass the time".

### Managing life including work

Managing life in terms of the basic activities of daily living was not discussed. It was generally felt that most people, when faced with a problem in this area, found their own solutions. A critical factor was time and not too much interference from the 'experts'. As one participant stated:

"I would rather do something myself, provided everything is in the right place before I start. Like making a meal. It is so important to be left alone. There are quite a few aids like advanced potato peelers on the market now, but I want to use the one I have always used. It is simple and does the job."

Another study (O'Day, 1998) identified that disabled people in work do not highlight their problems to employers until a crisis point is reached and the retention of their job is jeopardised. People in this situation frequently leave employment because the negotiations required seem too difficult. Participants in this study did not talk about this but there was some discussion about poor design in the workplace which deterred people from even setting out into the job market.

Poor employer attitudes were also highlighted and a lack of flexibility and imagination was cited as one reason why disabled people found the workplace hard to negotiate. One man, who was no longer employed, felt that he could accept the fact that he was a little slower because he could work longer periods to make up the deficit.



Older computer users in Norway learn how to surf the internet.

Work was clearly a source of satisfaction, although not without its challenges, if you required a wheelchair to get around. One participant has been a public servant all her working life. She explained that she kept a wheelchair at her office to avoid having to lift it in and out of her car - a saloon. She uses 'Direct Payments' to employ her own support worker. She felt in control of a complex situation and having a support worker meant, that she could be involved in more opportunities

"to improve the situation for other disabled people".

In general, work was described in positive terms but the environment could potentially create embarrassing situations that made people feel awkward. One participant who was deaf – an impairment which, as she pointed out, is difficult to see – found a lack of appropriate communication devices in the workplace an impediment to achieving her maximum contribution.

Another participant related how she disliked having attention drawn to her because she had to be lifted up steps or manoeuvred around other obstacles in the workplace because people had not considered using an accessible venue for a meeting that she was required to attend.

### Taking risks

The final theme to emerge from this study is about being trusted to take risks. This came out strongly from the interviews. Participants talked about a number of 'risky' activities they undertook and attitudes they encountered in relation to these. As one of them said:

"Cleaning the shelves in the kitchen is a real problem as I have to use a stepladder. I'm perfectly capable to do this but everyone insists I shouldn't do it. It makes me feel very old."

All risk taking has to be balanced against the risk to other people but this can be mitigated against with improved planning and better design. Insurance was cited as being an area that required particular attention (see chapter 4, Disability unplugged).

## Feeling independent

The focus groups discussed how it felt to be independent and how it felt when this was compromised either by the attitudes of other people or by an unfriendly environment.

| Independent  | Dependent  |
|--|--|
| Relief   | Anxiety  |
| Confidence   | Uncertainty  |
| Self-determining   | Managed by others:<br>unpredictable outcomes                         |
| Power  | Helpless   |
| Able to take new opportunities                                     | Excluded from ordinary life  |
| Life is about choices  | Closing down of opportunities  |
| Aware of the difference between<br>the possible and the improbable | Everything becomes difficult and<br>problematic                      |
| Other people are dependent on you                                  | You are reliant on others' offers of help                            |
| Proud  | Shame and embarrassment  |
| Anticipation of a positive future                                  | Unwillingness to plan, resistant to<br>change, fearful of the future |

### 23.1 How does it feel?

Independence versus dependence.

Table 23.1 shows participant's feelings associated with being independent and dependent. It is clear from this and other findings that disabled and older people value their sense of independence, a sense that goes far beyond simple functional ability. It would appear that an emphasis on trying to change someone's capabilities may be counter-productive if the end result draws attention to these incapacities.

It appears that a key factor to someone retaining a sense of independence is recognition by society of their need to be productive and to contribute to the well being of others. Several key factors allow them to maintain control over their own lives and to feel a sense of social worth:

- sensible insurance arrangements
- reliable and accessible transport, both private and public
- accessible hotels that welcomed disabled and older guests and employ thoughtful staff
- spacious retail outlets that recognised the needs of disabled and older customers, both in purchasing decisions and in shop and merchandise layout.

In addition, activities relating to food were considered to provide a strong sense of autonomy. Eating out was a popular activity, with audio menus regarded as a useful way to accommodate the needs of visually impaired people. Food preparation played an important part in maintaining the role of parent, friend and provider of care. However packaging was cited as problematic if any kind of dexterity problems were present.

The heavy emphasis placed on personal grooming was an unexpected outcome of the study in its contribution to the sense of independence. This does not appear to have been identified in other similar studies and yet it might seem obvious. Looking good increases self confidence and is linked to self esteem and feeling valued. Products such as lipsticks, sanitary towels and hairbrushes were all identified as items that could be designed differently.



## Summary

By exploring the meaning of independence with a cross-section of older and disabled people we have learnt that the word 'independence' is used as a shorthand to convey a complex collection of factors and feelings. As single instances, they appear to be of little importance but when seen as an overall condition of someone's daily life they contribute significantly to a person's self worth and sense of being in control.

For most people, the importance of reciprocal relationships and mutual activities could not be under-estimated, although time alone was also valued. Products and services should be designed in recognition of this, so they create and enhance opportunities for people to have choices about being with other people or alone. Isolation appeared to be the thing people feared most. Exclusion from mainstream activity, special provision and dependence on unreliable services were the factors most likely to bring about a sense of dependence.

Independence also means looking good, being listened to and having one's opinions valued, being trusted to take risks, having the opportunity to be part of reciprocal relationships, and social interdependency. Interestingly, it seems that other people's expectations and attitudes create the most significant barriers. A focus on solutions

in which the person has a strong voice and can influence the process by which these are sought is key to feeling independent and capable.

However the sense of independence is elusive for the participants. This is because it is centred on subjective factors that individually seem unimportant - although when any one of these is disrupted or missing, an overwhelming sense of dependence arises. When this occurs, people move away from mainstream products and services into a world where those products and services available do not support their sense of independence.

This returns them to a situation where there is a fascination with physical prowess and less concern with living life to the full. It is worth speculating what this might mean in terms of an inclusive design perspective. An emphasis on the positive attributes of interdependency and dependability might lead to solutions that address negative images of need and dependency – and create the circumstances in which people feel independent and valued.

It is clear that independence is an infinitely variable self concept; for every person it will depend on their experience of the barriers existing in the environments encountered. However if a more inclusive approach is taken to products and services, a greater proportion of the population will attain and maintain a sense of well-being and independence.

## Acknowledgements

Chapter title page image: Susanna Berger-Steele, RCA Industrial Design Engineering student, flexible handled cutlery helps people maintain their independence. Other images courtesy of: Ivan Coleman, Matt White; Julia Cassim, Sidsel Bjørneby, ALWO, Domus Academy and Guynes Design.

## Further reading

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## Chapter 24

# Observation for innovation

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This chapter explores the role of observational, ethnographic methods in design. Attempts to incorporate ethnography into the design process have had much to do with the realisation that the success of design depends upon adequately understanding the social context into which systems are placed. The use of observational methods in both commercial and academic design projects are documented. The authors advocate observational methods for design, looking at the design setting through the eyes of those who inhabit it, with as much sensitivity as possible.

## Observation for innovation

The purpose of ethnographic analysis is to produce sensitising concepts and models that allow people to see events in new ways. The value of these models is to be judged by others in terms of how useful they find them. (Hammersley, 1992: 15)

Professionals in the innovation and new product development fields are increasingly turning away from quantitative evidence-based research methods as stimuli for design towards research methods that bring them closer to peoples aspirations and their lives as really lived. Many of the methods employed for gaining this information have transferred from social sciences, such as psychology, sociology and social anthropology. Innovation professionals have taken these up in various ways. Design companies such as PDD and Seymour Powell employ lead researchers to inform their clients and their design teams. Others such as IDEO work with human factors people and have designer researchers assigned to each project team. Large corporations such as Hewlett Packard have an R&D group whose remit is to research external communities for innovation opportunities. There are also now a growing number of research companies who market themselves under a variety of categories from market research to usability.

What methods are commonly employed to gain user insight? Although there are a number of conventional methods designed to 'capture' user requirements, insights or views of the world, as 'users' come in a multitude of forms, traditional methods of investigation have singularly failed to capture the richness of the user experience. In consequence traditional quantitative methods have given way to more user-orientated qualitative investigative techniques. Market Research

**Ethnography with its emphasis on the *in situ* observation of interactions within their natural settings seemed eminently suited to bringing a social perspective to bear on system design**

approaches, relating specifically to the consumption and perception of particular products and services utilise social surveys, consumer evaluation panels, and focus groups. Human Factors perspectives, originally mainly dealing with work related human machine interaction, have now expanded to improve usability trials of all sorts of artefacts. Initially, this approach tended to be quite mechanistic and laboratory based generally occurring after the initial innovation stages of NPD. More recently qualitative methods have been deployed to explore ephemeral issues that relate to product design. This allows for ethical considerations as well as user needs to be integrated into the design frame. The methodologies employed in these studies provide a window into the lives of people with disabilities and enable tentative remedial designs to be undertaken.

### **Moving Towards Observational Research**

The concern to balance detailed documentation of events with insights into the meaning of those events ...

(Fielding, 1994: 154)

Another development has been a growing interest in observational research or ethnography, not only in informing design but increasingly to seek opportunities for new design development. Ethnography has achieved some prominence as a contributor to the design of distributed and shared systems (Hughes et al., 1994). Attempts to incorporate ethnography into the design process have had much to do with the realisation that the success of design depends upon adequately understanding the social context of use. Traditional methods of 'requirements elicitation' were seen as in need of supplementation, by approaches more attuned to gathering relevant data in 'real world' environments; that is, settings in which systems were likely to be used rather than in laboratories or other artificial environments. Ethnography with its emphasis on the *in situ* observation of interactions within their natural settings seemed eminently suited to bringing a social perspective to bear on system design.

The main virtue of ethnography is this ability to make visible the 'real world' sociality of a setting. As a mode of social research it is concerned with producing detailed descriptions of the 'workaday' activities of social actors within specific contexts (Hughes et al., 1994).

It is a naturalistic method relying upon material drawn from the first-hand experience of a fieldworker that seeks to present a portrait of life as seen and understood by those who live and work within the domain concerned. It is, as Fielding (1994) suggests;

a stance which emphasised seeing things from the perspective of those studied before stepping back to make a more detached assessment. ... mindful of the Native American adage that one should 'never criticise a man until you have walked a mile in his moccasins' (Fielding, 1994: 156)

perhaps with the added advantage (as the old joke goes) that when you do criticise him you're a mile away and you've got his shoes.

Ethnography, as we practise it, views activities as social actions embedded within a socially organised domain and accomplished in and through the day-to-day activities of participants. It is the ability of ethnography to understand a social setting as perceived by its participants (the archetypal users) that underpins its appeal to developers. When used from an ethnomethodological stance ethnographic work involves a renewed and unprejudiced look at the phenomena that have frequently become obscured beneath layers of theoretical abstraction and speculation. It sets out:

to treat practical activities, practical circumstances, and practical sociological reasonings as topics of empirical study, and by paying to the most commonplace activities of daily life the attention usually accorded extraordinary events, seeks to learn about them as phenomena in their own right (Garfinkel, 1967)

The aim then is to observe and describe the phenomena of 'everyday life' independently of the preconceptions of received sociological theories and methods, to be 'led by the phenomena' rather than by the concerns and requirements of a particular sociological standpoint. This means taking an 'unmotivated' approach to the activities, looking just to see what people are doing, rather than seeking to identify things which are 'sociologically interesting' in them.

## What is involved in 'doing' observational research?

When you marry, marry a lady anthropologist. She will have been trained for years never to interrupt you and to say only just enough to keep you talking. (quoted in Barley, 1983)

Although ethnographic methods can take a variety of forms its chief characteristic is the researcher's immersion in the milieu of study, and the detailed observation of circumstances, practices, conversations and activity that comprise the 'real world' character of work settings. The aim of ethnography is to assemble an account of the way in which people manage and organise their lives as natural social actors, by trying to obtain an 'insider's' view. This necessitates the fieldworker becoming involved in the setting and the activities being studied in order to gain the same perspective, as far as this is possible, of the actors concerned. This counteracts the temptation when studying others' lives to read things into them.

This is the reason why ethnography insists on approaching the investigation of a setting without theoretical preconceptions as to what will be found, since the social world is not organised in ways that analysts and researchers want to find it. Ethnographers do not want to impose a framework on the setting but to discover the social organisational properties of that setting as it is naturally exhibited. However, things that are familiar are extremely difficult to see clearly because of their very familiarity. The apophthegm, 'It is not the fish that discovers the water' aptly captures this feature of ethnographic enquiry; drawing attention to the difficulty of seeing things which are 'right in front of one's eyes'.

In terms of the practicalities of ethnographic work, Evans-Pritchard, the famous anthropologist, wrote of how he sought some insight on how to do fieldwork from other, noted anthropologists and received advice that amounted to little more than 'don't drink the water and leave the women alone'. While this remains very good advice it should also be understood that ethnography is neither an esoteric procedure requiring immense amounts of training, nor is it searching for things that are hard to find. Nor, however, is it simply 'hanging around'. While much of ethnography does involve 'hanging around' this is not its point but a means of achieving the objective of uncovering the sociality of work. Much of ethnographic practice is simply about presenting

oneself as a reasonable, courteous and unthreatening human being who is interested in what people do and then shutting up, watching and listening. Ethnography requires simple abilities, including an ability to listen, show an interest in what people do and what they have to say, and tolerate long periods of boredom.

Knowing where to start any study is a daunting prospect. Our basic maxim is: start somewhere, anywhere. At the outset, start anywhere you can, collect as much data as you can, and eventually some form of understanding will emerge. In seeking to understand and describe a setting you don't need to look for it, it is there in front of you. As Sacks (1984) puts it "there is order at all points... tap into whomsoever, wheresoever, and we get much the same things." Consequently there is no need to suffer the agonies so well described by Agar:

You arrive, tape recorder in hand, with a grin rigidly planted on your face. You probably realise that you have no idea how your grin is being interpreted, so you stop and nervously attempt a relaxed pose. Then you realise you have no idea how that is being interpreted. Soon you work yourself into the paralysis of the psychiatrist in the strip joint - she knows she can't react, but she knows she can't not react. It is little wonder that sometimes people hide in a hotel room and read mysteries. (Agar, 1980)

**At the outset, start anywhere you can, collect as much data as you can, and eventually some form of understanding will emerge**

In terms of how to behave, while a researcher cannot cope with every personal idiosyncrasy there are one or two commonsense principles of conduct which should be followed as far as possible. The fieldworker is akin to a guest in the setting. For others, their commitment to the setting and what goes on there is their business, their job, and the fieldworker, no matter what his or her personal inclinations are, must respect this. A fieldworker must avoid offending people, challenging their self-esteem, or otherwise behaving in a crude manner. The point of fieldwork is to understand the social organisation of activities within the setting. This requires stringent attentiveness to what persons have to say and do. While this does not require an exaggerated show of interest in the boring details of what people do, it does require avoiding pre-judgements about what is of interest and what is not.

In terms of what does the fieldworker collect by way of data – this is the least of the problems of ethnography. The information is often

lying around in plain sight but no one has bothered to collect it up. There is nothing special to look for, nothing to find that is hidden. The ethnographer's job is to listen to the talk, watch what happens, see what people do when, anywhere, to write it down, tape it, record what documents can be recorded, and so on. The following is just an illustrative list of the sorts of things that can be collected and recorded:

- conversations
- descriptions of activities
- diagrams of places
- descriptions of places
- rough sociograms of who talks to whom and when
- jokes
- interviews
- job descriptions
- memos, notices, graffiti
- happenings
- transcripts of meetings
- forms
- war stories

It is not that such materials have any intrinsic value; the material is valuable insofar as it can be made relevant or useful for what it can tell us about the social organisation of activities. The art of ethnography lies in knowing what you are getting during the fieldwork and knowing what to make of it. The fieldworker will come out the setting armed with masses of notes, documents and recordings. The hardest task is to analyse this mass of material, to find out what it all amounts to and we find the following list of precepts useful 'aides to a sluggish imagination'.

- assume that the world is socially organised – and show how this orderliness is accomplished in the setting
- see the setting and its activities as socially organised from within: assume that the setting and its activities make sense to the participants and uncover and explicate that understanding
- understand the setting and its activities in terms that members' understand and use – look at the actual activities as they actually occur during the course of the work
- examine activities in all their detail
- treat activities as situated – activities are not isolated events but situated within a context which informs their sense and their character
- attend to the 'working division of labour': although individuals

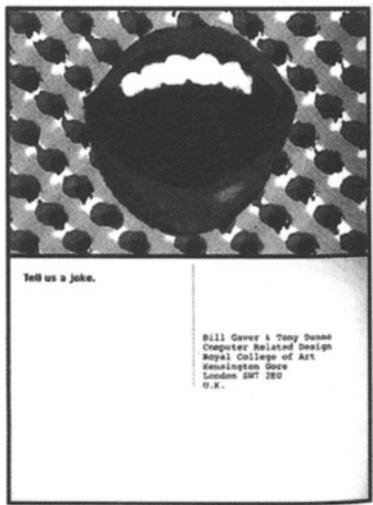
perform activities, these are often embedded in interaction and cooperation with others. Understanding how this moment-to-moment coordination achieved is one of the tasks of analysis

- attend to sequence of tasks and activities: our activities are, typically, sequenced if only in the highly general way that activities follow one another in some series. Thus, we get up in the morning, brush our teeth, have breakfast, get ready for work, go to work, etc. However, in the case of many activities, this sequencing has strong implications in that the sequencing is integral to the interactional sense of some activity
- attend to the ecological organisation of activities: it is people who do things not organisations. Actual work is performed by a person who has to determine how their activities fit into their responsibilities, their relevances, and how this will fit with that of others
- don't draw a distinction between expert knowledge and practical knowledge: avoid the tendency to underrate the skills and competencies involved in even the most routine of tasks since 'routineness' is very often the result of the experienced and practised grasp of complex skills
- don't treat settings as equivalent: this is a caution against spurious and unwarranted generalisation.

Making sense of the materials collected is, of course, not a matter of making any sense or, worse, trying to find the sense of the materials as if they had only one sense. However observational research is directed toward some research objective. Its purpose is to develop an understanding, an analysis of a setting that has some relevance to design objectives. In the context of system design, its point is to provide analyses of the settings and the activities into which systems have been, or might be, placed. Its purpose is to inform system design about the socially organised character of work or activities.

## Observation and design

The principle virtue of ethnography is its ability to make visible the 'real world' aspects of a social setting, seeking to present a portrait of that setting as seen and understood by those who live and work within the domains concerned. The intention is to see activities as



'Tell us a joke' one of Gaver and Dunne's cultural probe postcards.

social actions embedded within a socially organised domain and accomplished in and through the day-to-day activities of its users and to convey this information to designers. Observational approaches have the advantage of focusing upon the specific and detailed organisation of activities which people are carrying out and, thereby, upon the very activities which designers are concerned to understand, analyse and reconstruct. Observational approaches offer the opportunity to reveal unarticulated 'needs' or 'practices' of users. Practices they may not be aware of because they take them so much for granted that they do not think about them. As part of the initial process of requirements capture then, ethnography is valuable in identifying the exceptions, contradictions and contingencies of activities which will not (usually) figure in official or formal representations of that activity.

While there is growing acceptance of the utility of observational research, the approach has admitted problems. Of particular concern to many design practitioners is the practical problem of identifying generic design solutions from the situated and highly particularised and often-complex descriptions of social interaction provided by observation (Hughes et al., 1994 and 2000). Researchers are exploring a number of potential solutions to this problem, placing particular emphasis on the need to support communication and cooperation between ethnographers and designers in the process of abstraction and generalisation. Another focus has been the exploration of novel investigative techniques as complements to standard observational approaches. This becomes particularly relevant as technology moves out of the world of work and becomes embedded in everyday objects and features heavily in everyday life. As digital technologies have matured they have increasingly moved out of the workplace and off the desktop to our homes and neighbourhoods. The convergence of interactive digital systems, networks and mobile devices is transforming the ways we live our everyday lives.

Given these circumstances, one way in which we have attempted to increase the repertoire of available observational techniques is through the employment and adaptation of 'cultural probes'. 'Cultural Probes' (Gaver, Dunne and Pacenti, 1999), originating in the traditions of artist-designers may prove a way of supplementing observational investigations through forms of 'self-observation' and reflection. 'Cultural probes' (cameras, diaries, maps, dictaphones, photo-albums,

postcards etc.), may prove useful as a way of uncovering information from groups and settings that are difficult to research by other means and as a way of prompting responses to users emotional, aesthetic, and social values and habits. The probes furthermore provide an engaging and effective way to open an interesting dialogue with users. The Cultural Probes approach, Gaver argues, “act(s) as a design intervention that elicits inspirational material while avoiding the understood social roles of researchers and researched.” This ‘inspirational’ approach brings the user closer to the design space in a way that is different from conventional observational methods.

### Observation and design: some examples

So why have ethnographical observation methods been adopted as tools for design research and as sources of inspiration for innovation? In the previous sections you have been given explanations of the sorts of information that can come out of observational research. In this section we will consider why observational approaches appeal to designers as a research process and how it enhances their understanding of and communication with their clients. We will also look at the different ways in which a couple of design consultancies use observational research to serve the needs of their clients.

Traditional market based research can provide a lot of information about how many of something are bought by whom, where and when. Usability research provides information about the functional aspects of the product in use. Rarely do any of these approaches provide the necessary detail on how people interact with the things that make up their world on a day to day basis. Yet these are precisely the aspects of use that interest a designer. Designers are concerned as much with the emotional and psychological interaction with the artefacts they design as they are the technical aspects. Observation-based research methods provide access to this less immediately tangible type of data.

Designers are generally very visually oriented. They readily understand pictures and analyse visualised scenarios very rapidly. They are trained to conceptualise, in a visual way, things that don't exist yet and to use a wide variety of stimuli for inspiration. Because observational research is based on what is being seen designers immediately feel more comfortable with it, since it relates strongly to the ways they have been trained to think and express themselves.

**Different research communities are increasingly using qualitative research methods to help their clients in the innovation process**

They are capable of analysing and interpreting the data gained from observational methods. However there are dangers in this. Designers often are unable to distance themselves enough from their own preferences and habits, or from the design brief, to analyse the raw data as objectively as a researcher whose remit it is to bring a variety of results forward.

Ethnographical research methods enable designers and clients to understand consumers by looking at what people do and say about a particular product, activity, service or situation. Video filming aims to record events for later analysis, to communicate the experience to the design team and is perceived to be an easy to use medium. It has its pitfalls in that it requires skilled analysis by a trained researcher though, typically, this is not carried out by designers. However, researchers are often involved in analysis and interpretation workshops and clips can be selected to present to designers or to clients to illustrate a point. All in all, its advantages are greater than its disadvantages. With more discreet cameras, and people being more familiar with video as a leisure activity, the technology is readily accepted as a research tool, and research participants quite quickly disregard the presence of cameras and become natural in their behaviours. Advantages for researchers are that they can replay aspects of a situation, behaviour or interaction. These can easily be edited to provide visual stimulus for brainstorming, creating dialogue with a client, proving a point about an interaction or behaviour and viewing the unexpected and are easily drawn upon as a source of inspiration.

Different research communities are increasingly using qualitative research methods to help their clients in the innovation process. Each type of research is intended to be informative and/or inspirational to the designers and fits into the generic iterative design process at different points. Examples, from academic and commercial projects, of products/services that have been informed and developed through observational research methods include PDD – Clarks Shoes; Seymour Powell; and the Equator ‘Digital Care’ research Project.

At IDEO, a global product design consultancy, observation-based research techniques are used for inspiration purposes rather than for validation. Martin Bontoft says that the main purpose of his work as a design researcher is to challenge preconceptions. He spent some time working in a small Somerset village with a community of retired

people who were teaching themselves how to use computers. From the visual records his team were able to construct a psuedo-documentary that illustrated the ingenuity, interests and motivations of the group. He was able to pull out aspects that challenge some of the preconceptions of how older people are engaging with information technology. By creating a documentary he was able to set out a real life situation and open up the dialogue between the designers and clients about what might be needed.

Video-based ethnography captures, in a replayable form, the experiences of people living their everyday lives and often reveals unintended uses or interactions but is not enough in itself. If this is supported by interview, video diaries or cultural probes a rich resource is developed which can deliver so much more than the data captured on video. However video can be an ideal way to communicate the results of research. Clips can re-enforce a point, enhance information and bridge cultural divides. Co-viewing and shared exploration of ethnographic video can rapidly bring common understanding between designers and clients.

Seymour Powell Foresight (SPf) is a unit within the Seymour Powell design consultancy, that researches possible futures for their clients. SPf is not comfortable in using the term ethnography to describe its research and forecasting processes. Ethnography is a rather problematic term in the context of design research because designers cannot afford the time required for true ethnographic study. The aim of SPf is to develop product strategy for consumer technology companies and they seek to do this by helping them see into their possible futures and act effectively. They help companies get the balance right between the potential of emerging technologies, market insights and responding to real people's needs and desires. Their process focuses on user research methods that bring together insights gained by cultural anthropological methodologies and the instincts of designers. This way they gain deep insights into ways in which people adopt new technologies and fit them into the way they live their lives.

Design consultancies are looking for ways to provide contexts for the new products and services that they are developing. Design researchers can provide this by interpreting the behaviours and interactions that are made by the people under observation. Graham Moore, a freelance design researcher, believes that designers treat the

information that emerges from observation, especially video, differently. Designers will be looking for 'design gaps' and focus on spotting opportunities for innovation, whereas a social scientist may be more interested in the impact of technology on home life and interpersonal relationships. It is all down to the context of the interpretation – if you are a product designer or an ergonomist you'll focus on your own particular interpretation. Each is valid and important to the innovation process.

PDD is another design company to achieve success through observational research. They have undertaken a wide variety of projects where observational research methods were key to the successful development of new products. The company was approached by Clarks to help develop a new range of walking boots that would appeal to the growing, older-but-active market. Clarks believed that observational research methods would reveal new insights and opportunities for them. Their New Products' Manager had some experience of this through researching the way children deal with fastening and unfastening shoes and had been surprised and inspired by the results. PDD's approach, using video ethnography and in-depth interviews with a mix of leisure and walking enthusiasts, put walking boots into context. The study shadowed people across a variety of walking activities observing how footwear fitted into their habits and lifestyles. Researchers observed people carrying out various activities from shopping for shoes in different types of retail outlets, to tramping across fells and mountains. The results revealed insights into people's behaviour such as how they store and clean their shoes and what qualities were important in selecting a walking boot. The analysis determined the direction taken in designing the new range, where it would be sold, its price and how high a performance level was needed.

Another client of PDD, the Electrolux Group, is the world-leading producer of domestic appliances with 55 million products sold each year. The company had recognised through its own research that dishwasher sales were a potential growth area in an otherwise mature market sector. Electrolux wanted to explore the enigma that 80% of homes in Western Europe remained unconvinced of the benefits of dishwasher use, despite the promised relief from one of the worst household chores. They approached PDD to use its ethnographic research techniques to expose what drives and motivates the purchase



Clarks Active footwear.

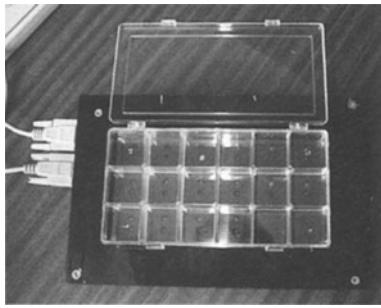
and use of a dishwasher. The study initially focussed on the purchasing motivations and shopping experience, using observation methods to capture the cycle from pre-purchase decision making to in-store purchasing through to delivery, installation and eventual use. The PDD team were able to create detailed profiles of the households that tracked decision making, reasoning and relationships to develop a model of dishwasher buying.

These few examples of observation-based design research being used as a successful component of commercial design practice illustrate that it is possible and valid to adopt and adapt techniques from apparently unrelated fields of expertise. In academic projects too observational techniques, and modifications of them, are being used to inform the design process. The Digital Care project (part of the EPSRC IRC Network project EQUATOR) employs a multidisciplinary research team to facilitate the development of enabling technologies to assist care in the community for particular user groups with different support needs. The aim is to examine how digital technology can be used to provide various kinds of support to sheltered housing residents and their staff. The setting for the project is a hostel, managed by a charitable trust, for former psychiatric patients. The overall aim of the hostel is to gradually introduce the patients back into the community and allow them to support themselves and any technology introduced into the setting should contribute to this goal.

Initial observational studies have identified a range of requirements regarding security, medication and location awareness. In terms of medication the residents primarily need a system that will reassure them that they are following the correct regimen, whilst leaving the task of managing their medication in their own hands. The aim here is not to automate a task but to encourage self-reliance and allay any fears. (Cheverst et al., 2001). Observations also suggest that some form of location awareness may be useful in facilitating and coordinating care pathways. For example, we have been investigating the design of location aware devices that would increase the residents' sense of safety and reduce their anxiety. However, any devices need to meet requirements dictated by the setting. In particular, any device needs to be highly dependable both in terms of location accuracy and the ability to communicate information in a timely manner.



Observing dishwashers in use.



The Medication Manager.

Our current work is concerned with the coordination of everyday life in the hostel. Here our interest is in the 'temporal rhythms' of the work of the hostel – shifts and shift handover, 'visiting' rounds, movement of residents into, around and out of the site, medication delivery, resident and staff meetings and so on. Such rhythms are not only important to the staff for coordinating work but also for the residents, serving a communicative and a therapeutic function. Knowing that events should happen in some sort of regular and predictable order, knowing what people were doing and where they were, from the orderliness of the day's work, was of value to both staff and residents. Of course such patterns can be affected by unexpected occurrences – and it is here where devices, for example some form of messaging system, might prove useful. Such devices, facilitate 'micro-coordination', 'softening' time through the revision and modification of schedules and affording the negotiation and management of commitments in acceptable ways. Following a design workshop we embarked on developing a short message service (SMS) or 'text' public display system. The system is designed to allow users to send a text message to a public display situated in the staff office. This quickly and easily permits staff off-site to keep their colleagues informed and up-to-date on off-site developments.

## Summary

In considering observational research as a set of tools that suit designers, we should consider both the value for designers and the disadvantages that might accompany these research approaches.

The value of using these ethno/observational methods is that they create change within the designer's view of the world and provide an inspirational resource. These methods enable them to become immersed in the lives of the people for whom they are designing and this then helps break down the stereotypes about how people live. The materials and data created through such methods builds a rich picture of people and their lifestyles and this relates directly to the fact that designers relate very quickly to data which can provide them with the means to visualise information and create scenarios.

Such methods often reveal aspects of daily life and aspirations that are unexpected and therefore are stimulating and inspirational to designers. This is especially the case where designers are trying to

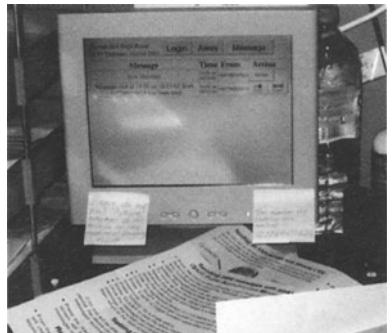
design objects of which people have no experience and where there are no comparable products. These revelations can broaden the creative baseline from which designers are working. They can also provide examples which aid communication with their clients and which support the design proposals. On the other hand there are aspects which could be seen as disadvantages. For instance, fieldwork and analysis using observational research methods is time-consuming and generally requires trained researchers for analysis. This could be viewed, by the client, as an expensive approach if user awareness is not deemed an essential part of new product development strategy. It also may require more time than is available to the design team for the overall project.

There are also some technical pitfalls to be considered. The sample population to be studied is key to the success of the research; this needs to be defined with the client and the design team well before any observations are carried out. In terms of methods for capturing information, video is not always possible nor ethical. Both researchers and designers need to be aware of the 1998 Data Protection Act and what limitations this might bring to the way in which they can use any information and what responsibilities they have towards any of the participants involved in the study.

Having said that there are disadvantages, it can be seen from the examples of design companies who are working in this way, that the advantages outweigh the disadvantages and that clients have much to gain.

In this chapter we have focused on understanding the deployment and analysis of observational data – of moving from ethnography to design – and on promoting an appreciation of the value of observational methods for socially informed innovative design. Certainly there are persistent problems in meeting the needs of developers and deploying the results of ethnographic studies in design and using the ethnographic material in a way that is both sensitive to design practices and useful remains a critical issue.

Our position on the utility of observational approaches has generally been that while ethnographic approaches may well inform or inspire design, it is for designers to draw design conclusions from the results of ethnography. We make rather modest claims for observational methods suggesting that the kinds of changes to design that result from



The SMS messaging system in development.

our approach are likely to be incremental rather than comprehensively transformative. There is no intrinsic design significance to the results of an ethnographic study, for such significance must be relative to the nature of the design exercise itself, to the purposes, conceptions, methods and plans of those making the design. We have consistently argued that observational research should be done independently of design preconceptions, that it should distance itself from the designer's preoccupations, enthusiasms and concerns and focus simply on the setting. Its mandate is to look at the setting through the eyes of those who inhabit it, with as much sensitivity as possible. Part of the point of undertaking ethnography is to ascertain whether the realities of a given setting conform to the designer's pre-conceptions. But this tension between the designer's and the fieldworker's roles is a positive feature, something which is important to and essential for good design, to highlight the difference between good abstract design solutions and good practical design solutions.

## Acknowledgements

Thanks to the Lancaster CSCW Group. Lancaster has an international reputation for interdisciplinary research in informing the design of computer systems in ways that take into account the sociality of work. Research projects have included air traffic control, the police use of IT, engineering plants, printing, hotels, households, artwork installations, and the financial sector. The pattern of working is for the sociologists to undertake ethnographic studies of the domain site, which are then used to inform system design. The group has also contributed to the philosophy, theory and methods of CSCW, and of the interdisciplinary working which it involves.

Thanks to Paula Neal, head of user research at design consultancy PDD Ltd, for access to case studies and photographs from Clarks and Electrolux projects, plus information on user research methods at PDD. Also to Graham Moore, consultant design researcher, for information on observation methods used by design consultants Seymour Powell.

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# **Understanding the challenge**

In this section, a trio of contributions defines the precise parameters of the challenge facing those whose goal is to design inclusively.

In the first paper, John Clarkson, Simeon Keates and Hua Dong follow up their earlier introduction of the concept of design exclusion with a study that seeks to quantify it, by mapping product demands against user capabilities. The methodology is demonstrated using the kettle as a product case study, showing the impact of design decision-making on usability.

In the second chapter, Clarkson and Keates go on to explore ways to counter design exclusion. In particular they present a model of the information flow required for successful inclusive design and identify areas for future research.

Finally, Carlos Cardoso joins Clarkson and Keates in presenting a methodology for evaluating how successful certain designs have been in including or excluding key user groups.

## Chapter 25

# Quantifying design exclusion

**John Clarkson, Hua Dong and Simeon Keates**  
University of Cambridge



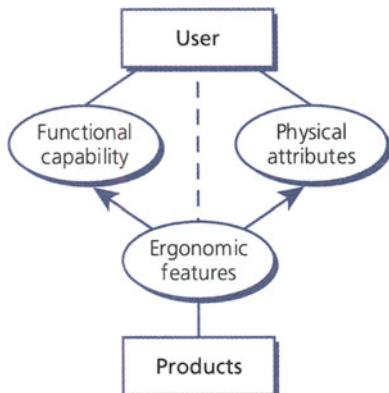
Design exclusion arises when a product places demands on the end-user that the user does not have the capability to meet. Such excluding products cause access problems for a wide range of users, particularly those with restricted capabilities, for example older users or users with disabilities. It is generally recognised that more inclusive approaches to design must be adopted to resolve this problem. A thorough investigation of design exclusion is the first step to meet this goal.

The aim of this chapter is to explore design exclusion through mapping product demands with user capabilities and, where possible, to quantify the number of end-users excluded by a particular set of demands. This chapter comprises three major parts. First, the information requirements for assessing design exclusion are reviewed, along with a review of user capability data and anthropometric data. Second, a method developed for evaluating design exclusion based on capability demands is described. Finally, the method is applied and evaluated through its application to a survey of design exclusion of domestic products and an illustrative case study.

## Inclusive design and design exclusion

The demographic changes occurring in the global population, together with legislative imperatives and development of new technology, have been instrumental in encouraging an upsurge of initiatives for designing for a wider population. Such initiatives have given rise to the concepts of 'universal design' in the United States, 'design for all' in Europe and, more recently, 'inclusive design' in the UK. All have the potential to benefit more users, in particular disabled and/or older adults, who are expected to interact with an increasingly complex technological environment, where user interfaces are usually designed only with the requirements of younger, 'able-bodied' users in mind (Stephanidis, 1997).

Having recognised that organisations designing products frequently impose limitations regarding product accessibility (HUSAT, 1996), our approach to inclusive design aims to highlight and reduce such exclusion. The ability to quantitatively assess the level of design exclusion has the potential to influence decision-making and bring about design improvement. It requires not only knowledge of the capabilities demanded by the product, but also of the number of potential users with at least that level of capability.



### 25.1. Information requirements

Relating users to the ergonomic features of a product.

### Information requirements for assessing design exclusion

The key requirement for assessing design exclusion is the ability to relate users to the ergonomic features of a product (Figure 25.1). However, the direct link (dashed line) between the two cannot be found from existing data. Consequently, based on the data available, the link is explored through two relationships: (1) product ergonomic features and user functional capabilities (sensory, cognitive and motion capabilities); and, (2) product ergonomic features and user physical attributes (anatomical dimensions such as height, reach, grip strength, etc.)

### Available data

There are several sources of capability data available from government disability survey, consumer research institutes and charity organisations (Martin et al., 1988; DTI, 2000; RNIB, 2002; RNID, 2002). The most recent multiple capability data set covering the Great Britain (GB) population is from the 1996/97 Disability Follow-up (DFS) (Grundy et al., 1999) to the Family Resources Survey (Semmence et al., 1998). This source recognises thirteen capability scales of which seven are particularly pertinent to product evaluation, namely: motion, dexterity, reach and stretch, vision, hearing, communication, and intellectual functioning. Each of these scales, ranging from 0 (fully able) through 0.5 (minimal impairment) to 13 (most severe impairment), has been aligned to ensure that equal scores broadly relate to equivalent levels of capability (Martin et al., 1988). As an example, definitions for the hearing scale are shown in Table 25.2.

The survey data allows the GB population to be segregated by age and gender.

### 25.2 User assessment scale

Hearing capability.

| Hearing |  | Severity score |
|---------|--|----------------|
| H1      | Cannot hear sounds at all  | 11.0           |
| H2      | Cannot follow a TV programme with the volume turned up                 | 8.5            |
| H3      | Has difficulty hearing someone talking in a loud voice in a quiet room | 6.0            |
| H4      | Cannot hear a doorbell, alarm clock or telephone bell                  | 5.5            |
| H5      | Cannot use the telephone   | 4.0            |
| H6      | Cannot follow a TV programme at a volume others find acceptable        | 2.0            |
| H7      | Difficulty hearing someone talking in a normal voice in a quiet room   | 1.5            |
| H8      | Difficulty following a conversation against background noise           | 0.5            |

The severity of overall disability can be calculated as a weighted sum using an equation:

$$\text{worst} + 0.4 \text{ (second worst)} + 0.3 \text{ (third worst)}$$

There are also a number of sources of ergonomic data, mainly in the form of standards, ranging from the generic to the product-specific and are applied widely in workplace design. As a branch of ergonomics, anthropometrics deals with body measurements, particularly those of size, reach and strength, which are related to physical attributes of the user. The Department of Trade and Industry recently up-dated a series of data sets: Chidata (Norris and Wilson, 1995), Adulldata (Peebles and Norris, 1998) and Older Adulldata (Smith et al., 2000).

These data sets contain anthropometric and physical strength categories. For example, there are 266 anthropometric dimensions and 28 strength measurements in Adulldata. However, these data sets are typically collected from many different countries and consequently are difficult to correlate against the capability data or to use to draw population-specific conclusions.

### 25.3 Weighted disability score

A weighted sum of the worst individual scores.

## Product assessment for identifying design exclusion

Focusing on design exclusion, a four-step approach for product assessment is proposed (Clarkson and Keates, 2002):

Step 1 *specify the context of use.* State any assumptions regarding the environment in which the product is used and the sequence of actions encountered when using the product.

Step 2 *assess the capability demands* imposed on the user by the product, subject to its defined context of use. Determine the number of users excluded from using the product and the reasons for their exclusion. The number of users disadvantaged, but not excluded, when using the product should also be identified.

Step 3 *assess the physical attributes* required by the product, subject to its defined context of use. Determine the number of users excluded from using the product and the reasons for their exclusion.

Step 4 *eliminate multiple counting.* Users may be excluded or disadvantaged for more than one reason. For example, someone

with both low-vision and restricted movement may be identified twice as being excluded by products requiring high vision and movement capability. Consequently, such multiple counting of individuals' multiple capability losses need to be corrected for.

Theoretically, there will be multiple counting when combining the results of both the functional capability and physical attribute assessments. However, if the data sets adopted are radically different, for example, from different countries, this can be difficult, if not impossible. Multiple counting from within single data sets should be eliminated wherever possible.

When assessing an existing product (assuming its design has incorporated basic ergonomic concerns), it is very important to judge its features against user capabilities. The aforementioned DFS disability severity scale can be adapted for such an assessment. There are many ways of performing product assessment (see chapter 27) but for our purposes here we will discuss a very straightforward approach: expert assessment based on capability scales.

A simple assessment form with the seven capability scales is used for expert analysis. An example of a typical form is shown in Table 25.4, for an acoustic guide device. Scores are given according to the descriptions of the scale items. If there is no obvious link between the description and the user-product interaction, subjective analogy is to infer the most appropriate score. For example, there is no relevant description of the dexterity capability required for pressing buttons on the device. Comparison is thus made based on existing descriptions. It is assumed that the required capability of squeezing water from a sponge (score 8.0) is comparable to pressing buttons, as both actions are related to the exertion of finger strength. Therefore a score is made with this reference (Table 25.5, see the row of dexterity).

A rough estimation of numbers of people excluded is available from mapping the scale to the GB population. In this case, the compiled exclusion resulting from each capability demand is as shown in 25.4.

#### 25.4 Levels of exclusion

Each capability demand leads to a level of exclusion.

| Disability | Locomotion | Reach and stretch | Dexterity | Vision  | Hearing | Communication | Intellectual function |
|------------|------------|-------------------|-----------|---------|---------|---------------|-----------------------|
| Score      | 7.5        | 8.0               | 8.0       | 4.5     | 5.5     | 5.5           | 9.5                   |
| Exclusion  | 1 031 000  | 116 000           | 423 000   | 387 000 | 400 000 | 74 000        | 115 000               |

**Product description:**

Acoustiguide 2000 wand – a device for a museum's audio guide system

**Context of use:**

The device is in a museum for user trials. The user collected the device from the Museum's staff and basic instructions (how to start the device and what functions are available) are given. A neck strap is already attached to the device.

**Sequence of use:**

- 1 strap the device
- 2 find the number next to the selected object
- 3 key in the number
- 4 press the Play button
- 5 listen to the commentary, adjust volume or pause when necessary

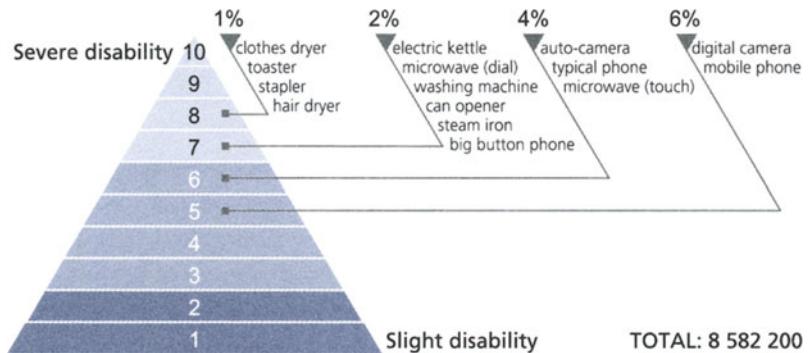
| Capability        | Score | Justification   |
|-------------------|-------|---|
| Locomotion        | 7.5   | This device only needs one hand for operation (NB: A user who always needs to hold on to something to keep balance will be scored 7.0)  |
| Reach and stretch | 8.0   | The relevant action is hanging the device around user's neck (the user hence should be able to put one arm up to head)  |
| Dexterity         | 8.0   | The dexterity demand made by the device is no more than pressing buttons that are reasonably well spaced and shaped, the device is light (260 grams) and the operation is very simple |
| Vision            | 4.5   | If the user cannot see well enough to read a large print book, he/she may not see the buttons well  |
| Hearing           | 5.5   | The enhanced voice is comparable to a person talking in a loud voice in a quiet room  |
| Communication     | 5.5   | To understand the explanation of the instruction is easy, even if the user may have difficulty in understanding strangers   |
| Int. functioning  | 9.5   | The usage of the device is intuitive and simple. It does not need much work intellectual  |

**General comments:** On the whole, the device is easy to use. If there is a label to tell the user how to start the commentary (find the number, input the number and press 'play' button), the staff assistance may not be required and the communication demands be reduced. The red 'C' button (function: clear) is confusing

**Duration of assessment:** 30 minutes

## 25.6 Exclusion in everyday products

From toasters to cameras.



However, the total exclusion will not be the sum of the exclusion totals in Table 25.4 because of multiple counting.

The following two sections describe in more detail how such assessment may be applied to a range of domestic products and how to calculate design exclusion, with reference to a survey of design exclusion and a specific case study.

## A survey of design exclusion

A range of domestic products has been assessed using the seven-capability scale. The seven capabilities can be compiled to three broad categories:

- Motion (derived from locomotion, reach and stretch, and dexterity)
- Sensory (derived from vision and hearing)
- Cognition (derived from communication and intellectual function)

An overall score can then be computed from the three capability scores by using the weighted severity equation (25.3). The user pyramid shown in Figure 25.6 shows the result of the survey of exclusion for everyday products.

User capability losses are divided into ten levels, with the lowest band 1, representing the mildest impairment and the top level, 10, being the most severe. Different shading is applied to differentiate mild impairment (score 1-2); moderate impairment (score 3-6); and severe impairment (score 7-10).

The whole user pyramid represents 8 582 200 adults with functional impairments – 20% of the GB adult population. The percentages listed show exclusion across the whole GB population. For example, products scoring 5 will exclude 6% of the GB adult population by the functional demands they made upon users.

## Case study

Consider the example of the kettle. Early kettles, such as kettle (A) in Figure 25.7, were made of metal and suspended over an open flame to boil the water. They had a large handle, which doubled as the means of suspension, mounted above the body of the kettle. Such kettles required limited dexterity and were well balanced for carrying and pouring, but care had to be exercised when using them close to the open flame.

The corded electric kettle (B) retained the shape and balance of the earlier models and removed the need for an open heat source, but had the disadvantage of the additional dexterity required to insert and remove the cord.

The early plastic jug (corded) kettles (C), introduced a new problem. The side-mounted handle changed the balance of the kettle, making it more difficult to use for those with limited upper-body strength. The more recent arrival of the traditional shaped cordless kettle (D) has partly resolved this issue although the overall weight of these metal kettles remains a problem for weaker users.

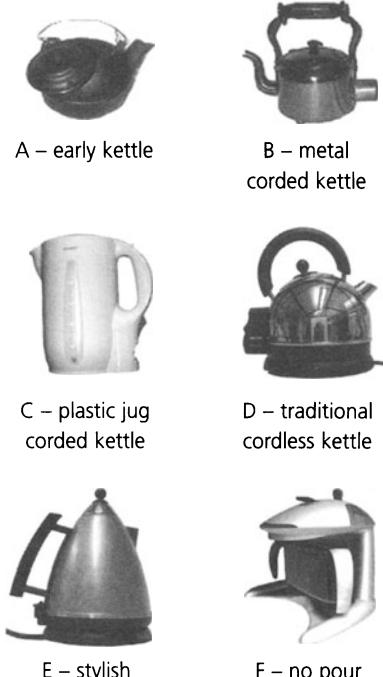
The increasingly diversified kettle design does not guarantee better inclusion of the product. Some 'fashionable' kettles (E) may be prone to failing usability and accessibility tests. However, when designers are aware of the issue and attempt to solve the problems with accessibility and usability, innovative solutions come as a result, such as the 'no-pour' kettle concept (F).

The three cordless kettles (D, E, and F) will be assessed in the following sections, using the four-step approach discussed earlier.

### Specify context of use

The first step of the assessment process is to state any assumptions regarding the environment in which the kettle is to be used and the sequence of actions encountered when using it.

In this case, it will be assumed that the kettle will be positioned to suit the height and mobility of the user and the basic actions required would be: to pick up the kettle (or the jug of kettle F) from its base; carry it to the nearby water tap; fill the kettle with water; switch it on; and, to pour the boiling water into a cup.



**25.7 A range of kettles**

From old to new.

## Assess capability demands

The second step of the assessment requires the determination of the number of users excluded from using the products as a result of the mismatch of their capability with the functional demand made by the kettles. This may be calculated by assessing the level of capability required to undertake the actions listed above.

Consider first the traditional cordless kettle (D); it is relatively heavy. The handle makes it easy to carry, and the coloured on/off button is big and easy to identify. It is possible to fill the kettle with water through the broad spout without opening the lid, which is tight and may require two-handed operation. When pouring water to a cup, the user needs to tilt the kettle to a steep angle with caution, as the broad spout is prone to spilling water. The inner water gauge is difficult to detect and the shiny chrome surface will easily be marked by water.

The stylish kettle with matt surface (E) is more stain-resistant. It is very well balanced when sitting on the base, but difficult to balance when being carried. The spout is narrow and pointed - good for pouring water into a cup, but not for filling the kettle through. The user needs to open the stiff lid by using the very small knob. The water gauge is hidden inside the kettle, hence the user needs to find it by looking into the dark interior through a small opening. The black on/off button is positioned under the black handle and attached to the black base, which makes it hard to find for a first-time user. In addition, the fiddly filter demands high dexterity to remove and replace (Figures 25.8 and 25.9).

The novel kettle design (F) is a new solution that arose from the design team working with disabled users. The designers identified problems from normal kettle usage and picked out key priorities for designing an inclusive kettle, namely:

- Safety (heat of unit/boiling water)
- Filling (spout size/location, water level, lid remove and replace)
- Pouring (seeing cup/tipping; weight, secure grip/low strength)
- Lifting (weight, accurate water level)
- Base (stability/cable management)
- Stigmatising (not for 'the disabled')



**25.8 The high dexterity demand**

Made by the fiddly filter.



**25.9 Filter replacement**

Demands high dexterity.

| Capabilities      | Kettle D (1.7 litre) |                    | Kettle E (1.7 litre) |                    | Kettle F (1 litre)  |                    |
|-------------------|----------------------|--------------------|----------------------|--------------------|---------------------|--------------------|
|                   | Minimum requirement  | Total 16+ excluded | Minimum requirement  | Total 16+ excluded | Minimum requirement | Total 16+ excluded |
| Locomotion        | n/a                  | 0                  | n/a                  | 0                  | n/a                 | 0                  |
| Reach and stretch | 6.5                  | 365 000            | 6.5                  | 365 000            | 6.5                 | 365 000            |
| Dexterity         | 5.5                  | 2 105 000          | 3.0                  | 2 727 000          | 7.0                 | 945 000            |
| Vision            | 5.0                  | 319 000            | 4.5                  | 387 000            | 8.0                 | 137 000            |
| Hearing           | n/a                  | 0                  | n/a                  | 0                  | n/a                 | 0                  |
| Communication     | n/a                  | 0                  | n/a                  | 0                  | n/a                 | 0                  |
| Int. functioning  | 7.0                  | 305 000            | 6.0                  | 488 000            | 10.5                | 60 000             |

The innovative solution is an aesthetically pleasing, light-weighted, 'no-pour' kettle with a cool wall, audio alert, auto-retractable cable, and a water level indicator with Braille.

The assessment of the capability demands placed on the users by each of the kettles is shown in Table 25.10.

### Assess physical attributes

The third step of the assessment usually requires an assessment of the number of users excluded or disadvantaged from using each kettle as a result of their physical attributes.

This may be calculated by assessing the range of attributes that affect the filling, switching and pouring tasks (Clarkson and Keates, 2002). However such data is either difficult to find or is not available. Basic ergonomic issues were found to have already been incorporated into those kettles.

For example, the clearance between the handle and the switch (18mm) for kettle E (Figure 25.11) is bigger than the male 95th percentile (16.6mm for the UK population and 16.7mm for the US population (see Figure 25.12).

Since designers usually adopt ergonomic data for the 5th to 95th percentile range of users, it can be assumed that the remaining 10% of users may be excluded, which in the UK corresponds to 4 600 000 adults. One might also argue that, for a complex design that requires contact with different parts of the body, and hence with several different body dimensions, a different 10% may be excluded each time.

However, making things easier and more comfortable for users certainly needs reconsideration. Currently users need to exert a lot

### 25.10 Users excluded

Result of capability requirements.



### 25.11 Switch clearance

An effective design.

| Country | Sex | Mean (mm) | 5 <sup>th</sup> %ile (mm) | 95 <sup>th</sup> %ile (mm) |
|---------|-----|-----------|---------------------------|----------------------------|
| UK      | m   | 14.5      | 12.5                      | 16.6                       |
|         | F   | 13.0      | 10.9                      | 15.1                       |
| USA     | M   | 14.6      | 12.5                      | 16.7                       |
|         | f   | 13.0      | 10.7                      | 15.3                       |

### 25.12 The ergonomic reference

thickness of the tip of the index finger



### 25.13 The kettle lid

Simple action can prove difficult.

Motion

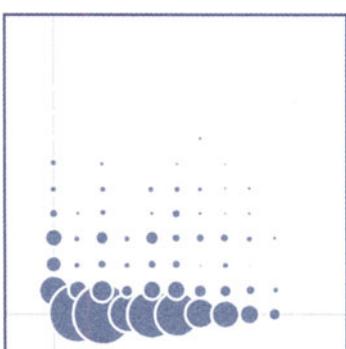


Sensory

### 25.14 Multiple counting

Sensory and motion capabilities.

Cognition



Motion

### 25.15 Multiple counting

Motion and cognition capabilities.

of strength to open the lids of kettle D and E, regardless of whether performing the operation with one or two hands (Figure 25.13).

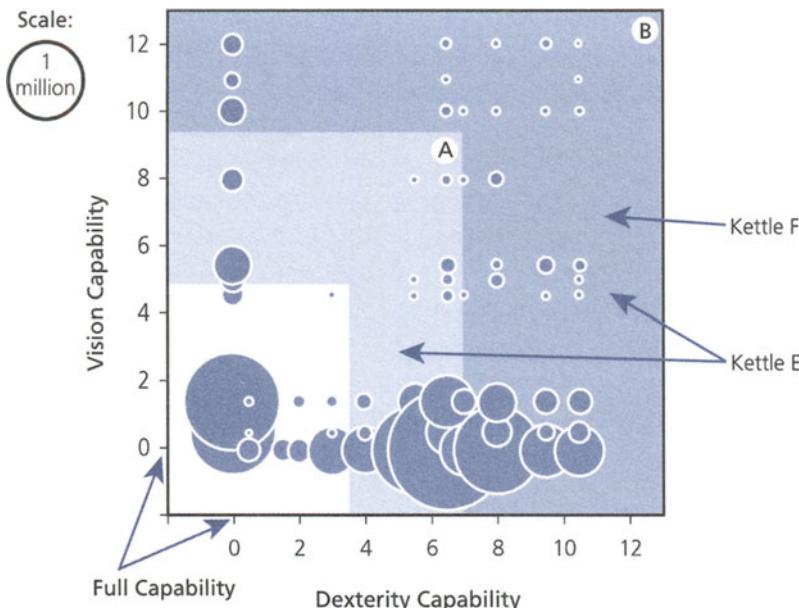
### Eliminate multiple counting

As mentioned before, an individual may exhibit more than one loss of capability or be affected by more than one physical attribute. Older users typically experience multiple minor capability losses when ageing, and many disabilities are accompanied by other losses of capability, mainly due to disease. For example, cataracts and glaucoma can cause problems with mobility, posture, co-ordination, sensory input, balance, location of body in space, vision and speech (Kroemer, 1997).

Whilst this may be significant when assessing the particular shortcomings of a product, it is important in determining the total number of users excluded from enjoying its use (Clarkson and Keates, 2002). Due to the lack of a single coherent data source describing capabilities and physical attributes, current efforts are focused on extracting data from the DFS disability survey (Grundy et al., 1999) to account for multiple instances of capability loss.

Noticeable coupling is found between the loss of motion capability and sensory capability (Figure 25.14), and the loss of motion capability and cognition capability (Figure 25.15). In Figures 25.14 and 25.15, the area of each circle represents the relative number of individuals exhibiting a particular combination of disabilities. Bubbles lying on the axes represent users with only one loss of capability, whilst the remaining bubbles in the plot show combined losses of capability. The nearer the bubbles are to the origin, the less severe the impairments they represent.

In the case of the kettles, significant coupling of related capability losses is found between sensory and motion capability, to be more



### 25.16 Multiple counting

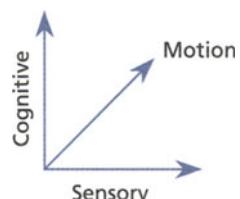
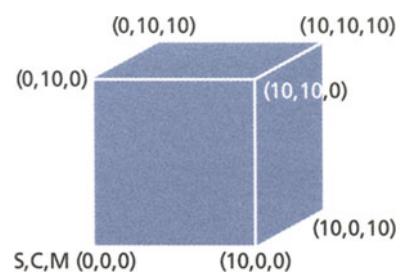
Design exclusion with kettles E and F.

specific, between vision and dexterity. The bubbles representing kettles E and F are shown in Figure 25.16. Polygons A and B together illustrate the exclusion for kettle E, for vision and dexterity demands. Polygon B, on its own, illustrates the exclusion for kettle F.

Bubbles inside polygon A show the difference between the inclusion/exclusion of kettles E and F, which corresponds to 1,880,000 GB adults. It is obvious that if kettle E is to be improved to achieve the same level of inclusion as kettle F, both vision and dexterity demand need to be reduced simultaneously. The reduction of vision demand will only include more bubbles hugging the vision axis, but not those in the coupling region. Such information is useful to designers, because when they improve products, it is important to know if the changes proposed will indeed include more users, or whether certain users will still be excluded for some other reason (Clarkson and Keates, 2002).

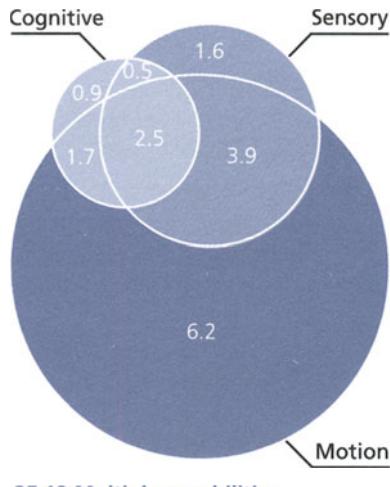
Bubble diagrams are useful for visualising combinations of two capability losses. Since the multiple capability losses can also be among motion, sensory and cognitive capabilities, three-dimensional visualisation may be required for further analysis.

Figure 25.17 shows the resultant cube model with three compiled scales from 1 to 10. The model has the potential to illustrate multiple



### 25.17 multiple counting

Capabilities and the inclusive design cube.



25.18 Multiple capabilities

Prevalence of capabilities % of GB 65+.

capability losses, extending bubble diagrams from two dimensions to three dimensions.

The prevalence of single capability loss, combined capability losses (i.e. two capability losses) and multiple capability losses (i.e. three capability losses) are summarised and illustrated in Figures 25.18 and 25.19, with respect to the percentage of GB 16+ adult population (Figure 25.18), and 65+ older population (Figure 25.19), respectively.

Again, Figures 25.18 and 25.19 highlight the existence of multiple capability loss, especially among older users.

## Discussion

The investigation of design exclusion provides valuable information for inclusive design. The survey of product exclusion demonstrates explicitly that many consumer products exclude people with moderate (score 5–6) or severe impairments (score 7–8). The case study of the assessment of a range of kettles reveals that the advancement of technology does not necessarily guarantee an improvement in design inclusion.

It is typical that no sooner is one problem resolved (for example: detaching the cord of kettles), than another is introduced (for example: poor balance). On the other hand, design changes do not always provide the benefit that may be expected (Clarkson and Keates, 2002).

Some people will always be excluded by any specific design if the crucial reason for exclusion has not been identified or justified (Keates and Clarkson, 2002). In most cases, it is the multiple loss of capabilities that accounts for such exclusion (e.g. locomotion and vision).

Solutions concentrating on improving the accommodation of individual capabilities are of limited effectiveness for including users with inter-related multiple capability losses. The coupling pattern reflected by the bubble diagrams not only indicates the significance of multiple capability losses, but also shows the scope for possible improvements.

For example: if the coupling is not significant, an improvement can be made by addressing each axis. Equally if the coupling is significant, then both axes must be addressed simultaneously for improvement to be achieved. Such information is useful for decision-making, since design managers and executives can thus determine optimal solutions

that are promising for including more users while remaining cost-effective.

## Summary

Inclusive design will only be encouraged when managers and designers are able to see more clearly the impact that their specification and design decisions have on the usability of their products (Clarkson and Keates, 2002; Keates and Clarkson, 2002). Investigation of the causes and levels of design exclusion provides such insight. Product assessments focusing on identifying the causes of design exclusion have been presented, followed by quantification based on the analysis of the mismatches between user capabilities and product functional demands. These can be used to highlight areas of particular concern in an emerging product.

Unlike most design for all approaches, this approach has incorporated a user capability range that does not configure an 'average user', and takes account of multiple combinations of impairments rather than focused on accommodating the individual capability losses. This approach has the potential of providing an in-depth understanding of crucial problems encountered by inclusive design, and hence has the advantage of enabling effective and efficient design improvement.

## Acknowledgements

Title page image: Roger Coleman.

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## Chapter 26

# Countering design exclusion

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It is known that many products, both software and hardware, are not accessible to large sections of the population. Designers instinctively design for able-bodied users and are either unaware of the needs of users with different capabilities, or do not know how to accommodate their needs into the design cycle. This chapter presents a model of the information flow required for successful inclusive design (the 'Knowledge Loop'), along with a methodological design approach for implementing successful inclusive design (the 7-Level approach).

Conventional product interfaces present serious difficulties to users with functional impairments. Conditions causing such impairments can occur throughout the life course, affecting all age groups. Certain symptoms, such as reduced hearing, appear with increasing frequency with advancing age, whilst other such as spasms are often associated with particular medical conditions, such as Cerebral Palsy. This has led to the common concept of the disabled and elderly as being groups requiring separate attention. Consequently, many design approaches for allowing accessibility by members of either group focus on their disabilities. However, the principal concern for a designer should be physical capabilities, irrespective of cause.

Currently, there is surprisingly little industry awareness of the benefits of inclusive design despite the inexorable growth of the global ageing population. Hence, there is an urgent need for design methods, based on a better understanding of age and ability related factors, which will lead to a minimising of the impact of impairments and thereby extend quality life.

## The knowledge requirements for inclusive design

To support inclusive design it is necessary to understand the knowledge requirements of designers and design commissioners, both in terms of content and format. The knowledge requirements include information about the end-users and also the tools and techniques for developing more inclusive solutions. This is an important element of the broader goal of delivering complete, appropriate and validated information to those who can deliver products and services that are designed to include the needs of the whole population. Such inclusion will be achieved through the improvement of both mainstream design solutions and the effective integration of the assistive technologies and devices that can ensure access to those at the extremes of capability distributions.

At present, the data needs of the information-users are being met either by the designers having to obtain the data from first principles for each project, or else by comprehensive approaches where large volumes of data are provided, but most of it is irrelevant for the case in hand. Examples of the latter approach include the common anthropometric texts (e.g. Peebles and Norris, 1998). The ideal solution for the information-users is to have sufficient data available on hand when it is needed – a kind of data ‘just in time’. The need for sufficiency is of prime importance – the data needs to contain all the necessary information, but no more, to avoid information overload.

The ultimate purpose of finding successful data representations is to support the concept of a ‘responsive designer’ who has the necessary understanding of the end-users to accommodate their wants and needs proactively during the design process and obviate the need for retrospective adaptations.

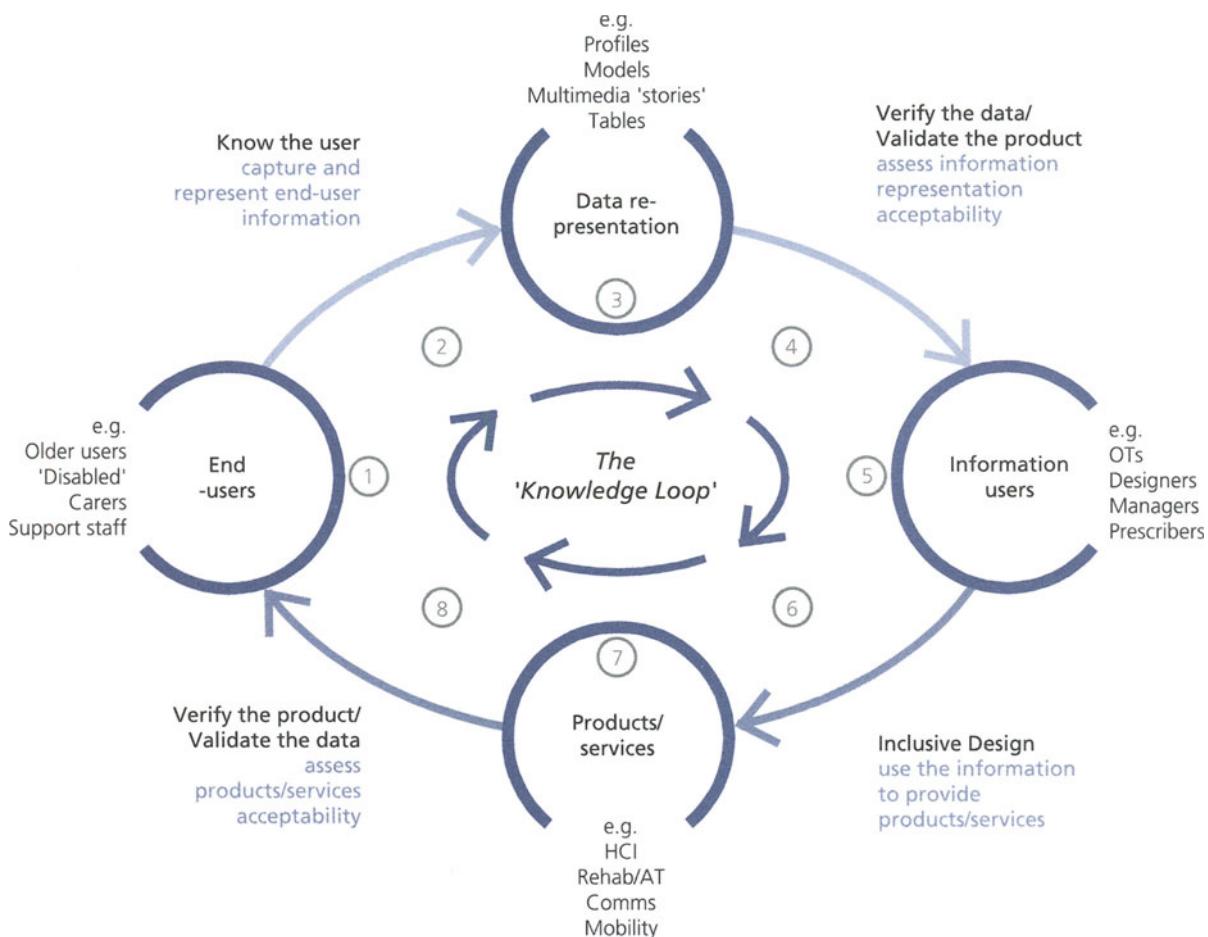
### The inclusive design process

Recognising that many inclusive (and universal) design approaches are fundamentally derived from user-centred design theory, it is clear that enabling inclusive design requires the successful capture of information about the end-user and representing that information in a form that is accessible for the designer. The designer then needs to have the necessary tools and techniques available to translate the end-user information into a concept, which can then be tested against the end-user needs and wants. Figure 26.1, the inclusive design knowledge loop, illustrates the full details of such a design process.

### Interpreting the knowledge loop

The knowledge loop is a robust, but subtle representation of the necessary information flows and activities required to produce genuinely validated inclusive designs. It also reflects the wider range of possible end-users and information-users beyond the ‘disabled and elderly’ and designers respectively. As such it can be interpreted in a number of ways. The loop can be entered at any point, but we shall consider it mainly with respect to the information- and end-users.

From the perspective of producing successful inclusive products, consider a designer (the information-user ‘5’ in this example) who wishes to make an accessible product. The first stage would be to



acquire the necessary information about the end-users and the available inclusive design methods '6'. The methods and data would be applied and a concept product/service generated '7'. The concept needs to be verified against the specification '8' to ensure that the product has met the stipulated functional requirements. However, to validate the product, it is necessary to test the product/service with end-users '1'. The data generated during the user trials needs to be captured '2' and summary representations '3' generated. Only once those summary representations are available can the product be truly validated '4'. If the product is not successfully verified or validated, then the designer revises the concept product and begins the process again. The same fundamental knowledge acquisition and transfer steps are required

### 26.1 The knowledge loop

Translating user-information into inclusive products and services.

from an occupation therapist wishing to prescribe the most suitable assistive technology.

From the perspective of capturing data about the end-users '1', the first stage involves identifying potential data capture techniques '2' and applying those techniques to generate suitable data representations '3'. The data generated can be verified to ensure that it is internally correct '4' before being passed to the information-user '5'. To validate the data generated, it is necessary to ensure that it is usable by the intended information-users, consequently the information-user has to apply the data '6' to test it. Only by generating products '7' to meet the user aspirations and needs originally observed can the data capture methods be truly validated '8'.

As a final note, it is important to recognise that the knowledge loop is intended for iterative application, and in practice develops through many cycles of concept development and testing.

### Implications of the knowledge loop

The fundamentally circular nature of the information transfer between end-users '1' and information-users '5' illustrates how future research activities can be performed in parallel.

The recognition that there are multiple end-user classifications and multiple users within those classifications, means that selection and definition of the WINIT target population is not a trivial task. Once the target end-users have been identified, successfully encapsulating their wants, needs and aspirations requires applying appropriate qualitative and quantitative methods. Techniques as diverse as ethnography and user modelling (Card, Moran and Newell, 1983) can be applied and provide equally diverse information. Depending on the entry point into the knowledge loop, it may be that a prototype product exists, in which case the end-user data that needs to be captured is how well the user interacts with the prototype. Product assessment techniques, such as user observation, systematic analysis and simulation may be applied (Cardoso, Keates and Clarkson, 2002) and further guidance is required on which methods to apply under which circumstances.

Deciding which technique to apply, to which users and then how to represent sufficient data to meet the designer's information needs at the precise moment when it is needed ('just in time') requires significant research effort. The corollary challenge is equipping designers with the

ability to obtain such information for themselves, or to know how to specify their own information needs and to identify where to go to obtain such information.

Looking at the lower half of the loop, the provision of appropriate inclusive design techniques to the designers is the principal requirement. However, identifying which technique should be applied requires consideration of the designer, the nature of the product being developed and the end-user information available.

Consequently, it becomes clear that for inclusive design practices to become optimised with respect to the cost of applying them requires a holistic view to be taken of the design process. Defining as much of the knowledge loop as possible in the shortest possible time will keep the overall design process swift and focused.

The knowledge loop is a powerful representation of the structure of inclusive design practices. For successful application, though, appropriate tools and guidance need to be provided.

## Developing a new inclusive design approach

There are 3 principal stages in design (Blessing, 1995):

- define the problem
- develop a solution
- evaluate the solution

These stages apply to all design processes, whether designing product interfaces, telephone handsets or design approaches.

### Define the problem

The aim of the new approach is to provide a practical, rigorous approach to inclusive interface design. Design typically involves the creation of solutions and then a review to ensure that the design criteria are met. At the lowest level the review process could involve a simple check to ensure that the resultant product offers the necessary functionality. At higher levels of sophistication, though, increasingly less quantifiable measures are required. The measures can range from whether the product is usable or accessible through to the outright qualitative, such as whether it is aesthetically pleasing and socially acceptable.

There are two principal approaches to design as far as inclusivity is concerned and they arise from whether functionality or usability/accessibility of the product are addressed first by the designer.

The first approach is that the properties of the product, such as its content or functionality, are already defined to meet set functionality objectives. Having these properties defined directly affects the properties of the interface selected. For example, a software interface will need to provide specific functions through menus, icons, toolbars and the like. Also the hardware input/output devices selected will need to support specific activities, for example text entry or cursor manipulation and so on. All of these properties then determine the level of functional capability required for the user to be able to interact successfully with the target product. In other words, the properties of the product are determining which users can access it. This is nearly always the result of the design process unless specific steps are taken at the outset to incorporate usability and accessibility measures into the design process.

The second design approach is that if the user's functional capabilities are known, then the range of hardware that the user can interact with will be defined as well. This in turn defines the interface elements that are accessible to the user and hence the range of tasks that can be achieved with the product identified. The product then has to be structured so that the required functionality it has to provide is available through a succession of the identified accessible tasks for the users. In this case, the functionality is being driven by the user's capabilities.

The traditional view of designers has been to follow the first approach, to specify the needs of the product and then through the interface place functional demands that the user must be able to meet. User-centred design practices, however, put the emphasis on the user capabilities driving the process in the other direction, as for the second approach.

The predominance of these two design approaches has led to the two principal strategies for making interfaces accessible for different user capabilities. The first strategy is to take the existing interface for able-bodied users and then tailor it retrospectively to different users, by adding further functionality to provide assistance or compensation. The second strategy is to change the definition of the user at the very outset of the design process to include a wider range of capabilities. These



**The BT Big Button telephone**

User-driven design.

approaches can be described as ‘reactive’ and ‘proactive’ respectively (Stephanidis, 2001).

The stipulated requirements of the application/product therefore have the potential to exclude certain sections of the population who cannot meet the functional capabilities necessary to meet those requirements. For example, consider a kettle. If the kettle has to be able to boil sufficient water to make a certain number of cups of coffee, then there is going to be a minimum weight associated with the kettle when it has water in it. Therefore, users will be required to have the strength to move that minimum weight if they are to be able to use the kettle. Anyone not meeting that strength requirement will not be able to use the kettle, irrespective of other design decisions made or product requirements stipulated.

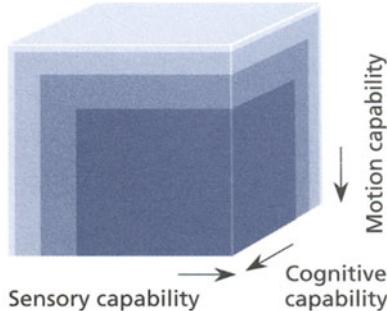
When developing a design approach for inclusivity it is necessary to consider the measures of success, i.e. the point at which the design is considered to have met the stipulated requirements. For inclusive design, the measure of success could be as simple as “how many people are excluded from using the product?”

However, this raises an issue that needs to be addressed at the strategic level of the design management, that of where the stipulated requirements should be set. Taking the example of the kettle, should the kettle hold 3 litres of water? Or 1.5 litres? Or 1 cup? The smaller capacity decreases weight and increases inclusivity, but the marketability also decreases. A managerial/executive-level decision is therefore required between marketability of the product and the level of population exclusion, and hence potential market size.

Many of these issues require the balancing of stipulated product requirements, demanded user capabilities and resultant population coverage. Influencing this will be the design approach taken. Consequently it would be helpful if a simple graphical representation of these properties was available that offered a visual summary of the level of inclusion achieved by the design. One such representation tool is the Inclusive Design Cube introduced in chapter 5 ‘Design exclusion’ and shown again in Figure 26.2.

## Develop a solution

In order to produce a usable and accessible product or service, it is necessary to adopt strongly user-centred design practices. The three



**26.2 The Inclusive design cube**

Mapping capabilities to the whole population.

stages of design discussed earlier can be applied to the design of a product interface. Extending the definition of the intended end-users to include a broader range of user capabilities affects all three of the above stages:

- *define the problem*: the problem definition should explicitly include reference to the intended target users;
- *develop a solution*: an appropriate design approach should be adopted for the target users;
- *evaluate the solution*: the target users should be included in the evaluation process.

The resultant product and its interface should meet the target goal of acceptability. As such, the problem definition stage should address both the practical (functional) and social acceptability criteria established by Nielsen (1993). The success in meeting that goal should be addressed in the final solution evaluation stage.

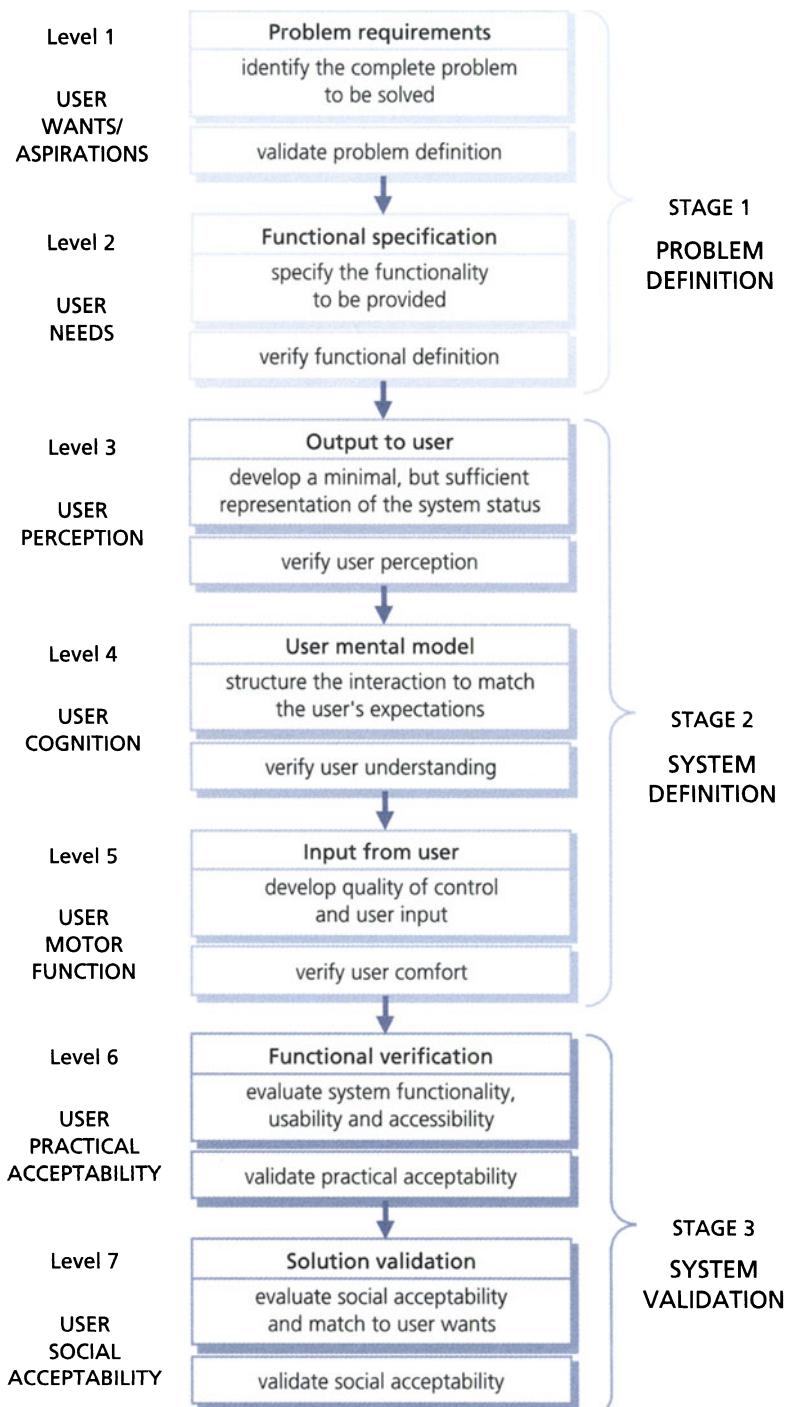
Developing a usable solution for a wider range of user capabilities involves understanding the fundamental nature of the interaction. Typical interaction with an interface consists of the user perceiving an output from the product, deciding a course of action and then implementing the response. These steps can be explicitly identified as perception, cognition and motor functions (Card, Moran and Newell, 1983) and relate directly to the user's sensory, cognitive and motor capabilities respectively.

Building on this theory of interaction, a design approach has been developed that expands the second stage of the design process, solution development, into three specified steps (Keates, Clarkson and Robinson, 1999). Each level of the resultant 7-level design approach, shown in Figure 26.3, is accompanied by user trials throughout and a final evaluation period before progression to the next level, thus providing a framework with clearly defined goals for system usability.

## Applying the 7-Level approach

The 7-Level approach (Figure 26.3) has been structured as a high-level model, so each level represents an aim, but the method of achieving that aim can vary according to the expertise and knowledge of the designer.

Level 1 defines the user needs, that is the social motivation for designing the product. This can be identified through softer,



26.3 The 7-Level design approach

sociological assessment methods. Questionnaires and interviews are good methods for identifying the user needs.

Level 2 focuses on specifying the required utility of the product. Traditional engineering requirements capture techniques (Beitz and Kuttner, 1994) can be used, as can task analysis (Nielsen, 1993).

Alternatively, assessments of rival products or user observation can provide insight into the necessary functionality.

Levels 3 to 5 focus on the stages of interaction. Usability and accessibility techniques can be applied directly to these levels, as can anthropometric and ergonomic data. Prototypes of varying fidelity play a key role in these levels.

Level 3 addresses how the user perceives information from the system. This involves assessing the nature and adjustability of the media used, their appropriateness for the utility, and the physical layout. Anthropometric data are important to ensure that the output is in a position that the user can perceive it. Ergonomic and empirical data from trials are also necessary to ensure that the stimuli are intense enough to be perceived. Ideally, environmental conditions, such as lighting and noise, also need to be identified and modelled.

Level 4 assesses the matching of the system contents and behaviour to the user mental model. Once the output channels are defined, the functionality (utility) can be added to the system and evaluated because the functionality for monitoring the system is in place. Literally the user can see or hear the data. Common techniques to map the user system behaviour to user expectations include cognitive walkthroughs.

Level 5 focuses on the user input to the system. As with level 3, this involves assessing the nature and adjustability of the media, their appropriateness for the utility, and the physical layout. Again anthropometric measures are important to ensure that the input media are within the operating range of the user. Ideally, empirical data from user trials need to be gathered to evaluate the effectiveness of the input solutions. These can be supported by adopting user modelling techniques. Where user trials are impossible, suitably calibrated user models can be used to provide design data.

Level 6 involves the evaluation of the complete system to ensure satisfactory practical acceptability, i.e. utility, usability and accessibility. Formal user trials are essential at this point, before the design can progress to the final level.

Level 7 assesses the resultant system against the user needs. This mirrors Nielsen's social acceptability requirement. Softer, more qualitative approaches are generally needed, such as surveys, interviews and questionnaires.

Although the 7-Level approach is presented as a flow diagram, in practice each of the stages can be applied in an iterative manner. Indeed, in many circumstances, it may prove essential to iterate within and between levels. However, the general order of levels should be applied in the order shown in Figure 26.3.

The underlying strength of the 7-Level approach is that because it was derived from a model of interaction that was not product-specific, the approach itself is not product-specific either. Consequently, it is applicable to a wide range of products.

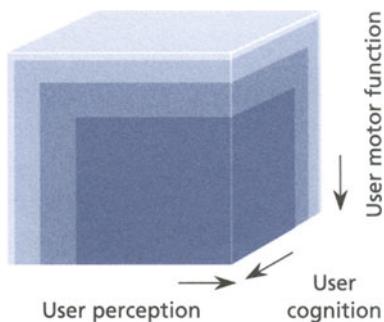
### The 7-level approach and inclusive design cube

Both the 7-level approach and the inclusive design cube share the same inherent emphasis on the interaction consisting of perceptual, cognitive and motor actions. Consequently, if the 7-level approach has been adopted as the framework for the development, then the Inclusive Design Cube (IDC, introduced in Chapter 5), can be adapted to monitor the population coverage achieved by different design choices, as shown in Figure 26.4. Effectively, the 7-Level approach can be thought of as designing for each axis on the IDC. The modification necessary to use the IDC for this is a straightforward re-labelling of the axes to reflect Levels 3 to 5 of the 7-Level approach.

### Evaluate the solution

The 7-level approach addresses each of the system acceptability goals identified by Nielsen (1993). The approach has been applied to a number of case studies including the design of a software interface for an interactive robot (Keates, Clarkson and Robinson, 1999) and a concept information point (Keates, Clarkson and Robinson, 2002). It is important to be able to modify and refine the interface iteratively, combining both design steps and usability evaluations. Such evaluations typically involve measurement against known performance criteria, for example the measures of inclusive merit proposed in chapter 5.

The two case studies illustrate the successful use of the 7-level approach and the IDC. However, to be of genuine use, both tools



26.4 The inclusive design cube for use with the seven-level approach.

should be usable by designers with varying backgrounds and expertise, and also in different circumstances.

With this in mind, the 7-Level approach was envisaged as being a framework, rather than a string of rigorously defined steps, and offering designers the freedom to select which design tools they deem most appropriate for each level and for the product being considered. Further work is being carried out on populating the approach with common design tools and usability methods.

### **The 7-Level approach applied to other products**

While the 7-Level approach and the IDC have been designed to be straightforward to interpret, the complexity of their application depends upon the complexity of the product being considered. As with all design tools, design of simple products with limited functionality is easier than the design of complex systems. The underlying strength of the 7-Level approach is that because it was derived from a model of interaction that was not product-specific, the approach itself is not product-specific either. Consequently, there are no philosophical reasons why it should not be applicable to a wide range of products. There may, however, be difficulties with the minutiae of implementation and these are closely connected to the potential difficulties in applying the IDC.

### **The inclusive design cube applied to other products**

As discussed earlier in the paper, the IDC is a potent visualisation tool that helps the designer select appropriate design approaches and alternatively summarises the inclusivity of design variants. However, there are potential difficulties in populating the cube.

Populating the IDC for a specific product requires the designer to be able to assess the functional demands of the product and then to map those back to the target population. The designer has to identify the key actions involved in using the product, then establish the levels of sensory, cognitive and motor capabilities required to perform those actions. Those capability requirements then have to be mapped to proportions of the target population. However, unlike anthropometric data, there are comparatively few complete population data sets that describe the prevalence of different level of capability in the general population.

The authors are currently developing a tool to allow designers to interrogate a database and to automatically produce IDCs based on capability requirements. However, user capabilities may not be the only cause of exclusion. Basic human factors issues, such as ergonomics and anthropometrics are equally capable of excluding people if not implemented correctly. If the version of the IDC adapted for use with the 7-level approach, Figure 26.3, is used then the human factors exclusions can be incorporated directly into the cube. So, for example, exclusion arising from a viewing screen being set too high can be included with other sensory exclusions, to give a complete exclusion for the user output level of the analysis.

There is a further potential source of difficulty. It has been assumed that the presence of one impairment in a user is independent of the presence of other impairments. It has been further assumed that there is no correlation between anthropometric and capability data. However, this has yet to be verified. Consequently, as part of the tool for mapping capabilities to populations, the authors are also identifying the rates of correlation between multiple impairments. It is intended to incorporate anthropometric data at a later stage.

## The way forward

This chapter has presented the need to counter design exclusion and proposed a number of areas for future research to address - specifically, the provision of sufficient, 'just in time' information to designers about the end-user needs, wants and aspirations, matched directly to complementary inclusive design methods.

The necessity for sufficient information arises because designers will instinctively design for their own capabilities and skills. Any user who is significantly different from either of these criteria may be excluded from using the final product design, simply because the designer was either unaware of their needs, or did not know how to incorporate them. Consequently, it is evident that the end-user information should include all relevant aspects of the user-product interaction. However, the provision of too much information is equally ineffective. Industrial designers have no wish to plough through many pages of data to find snippets of information. Presenting them with large volumes of primarily irrelevant data will not encourage the adoption of inclusive

design practices. Instead, a happy medium is required, where just the right amount of information is provided at just the right time to the right person. The provision of such data can be accomplished by either having rapidly customisable data sets available ‘off-the-shelf’ or by developing rapid, focused product assessment techniques.

While the underlying principles of the above are available within the research community, they are not making the transfer into industrial practice. Similarly, the research community has proposed and developed a number of tools, techniques, methods and philosophies for the design of more inclusive products and services. However, industry uptake is slow and has often only happened because of the threat of litigation under punitive legislation.

Given the sound economic arguments in favour of more inclusive products, that companies are still dragging their collective feet to adopt such practices implies that industry perceives that there are fundamental problems with the proposed inclusive design processes. The most common such perceived problem is that of increased cost and time to develop products and services through the addition of more requirements and constraints into the design process.

Streamlining the existing inclusive design techniques and developing new tools and techniques matched to the available data about the end-users should help alleviate some of industry’s reservations about the cost and time implications of adopting inclusive design practices. The ultimate goal is the provision of the right information to the right person at the right time, together with focused methods of applying the information in a cost-effective manner. This would be a big step forward towards the concept of ‘responsive’ designers, no longer designing for their own capabilities and skills, but automatically considering the implications for the wider population of each of their design decisions.

Supporting such a goal and making it feasible for industry should be the focus of the research community. To do so requires each of the stages identified in the inclusive design knowledge loop (Figure 26.1) to be considered explicitly, while retaining the overall perspective of the entire design process afforded by the knowledge loop. Inclusive design will only be encouraged when managers and designers are able to see more clearly the impact that their specification and design decisions have on the usability and accessibility of their products. In other words,

for industry to adopt inclusive design practices, each component stage of the knowledge loop must match with the other stages to give a coherent, feasible design approach. Only when the loop is fully populated with the necessary tools, techniques and data, will inclusive design practices become sufficiently straightforward for industry to implement. The challenge for the research community is thus to meet that need.

## Acknowledgements

Chapter title image, Julia Cassim

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## Chapter 27

# Assessment for inclusive design

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## **Current practice in design**

Many designers view the process of design as primarily creative and informal. They often rely heavily on their intuitive response to the design problem when developing a design solution. As such, without an explicit effort to address the needs of the end-users, designers can be said to design for themselves.

This is not a problem if the end-users are very similar in background, knowledge and functional capability to the (typically young, male) designers. However, when considering the wider population, with the rich variety in backgrounds, knowledge and capabilities, it is highly probable that significant mismatches will occur between the product demands and the end-users (Keates et al., 2000).

The result is that the growing older adult population in most developed countries and people of all ages with diverse temporary or permanent impairments are being disabled unnecessarily by many existing mainstream design solutions. This disablement is caused by a mismatch between the product demands and the users' functional capability (i.e. physiological and psychological) profile (Coleman, 2001).

Such mismatches can lead to minor inconvenience and frustration, human error, accidents, or even absolute exclusion. The disadvantages are obvious for both the users and the service providers. For the user, it is the denial of access to the independence in daily living that everyone is ideally entitled to. For industry, it is both the wasted opportunity to enlarge their market and also the risk of being sued under an increasing burden of legislation created to defend the rights of the aforementioned disadvantaged groups.

The generally inadequate design response to the needs, requirements and aspirations of these large potential markets, suggests that designers are either not aware of the needs of these populations, or else they lack the tools to tackle the problem in real-life project circumstances. Taking into account such user's requirements, along with, for instance, issues concerning product safety regulations, sustainability requirements, new technology developments, increasingly competitive markets and so forth, add to the complexity of the design process.

Designers' predictions or personal experience of what users want and expect from (and how they interact with) any design are unlikely to take into account all the important information a

genuinely usable design requires. Consequently, there is a need to develop and implement effective, reliable and validated approaches for the assessment of products and services, which a wider population can benefit from (Cardoso et al., 2002). These approaches should ensure that realistic and applicable information regarding the human characteristics of the broadest possible target end-user population is actively considered from the early stages of, and subsequently throughout, the whole design process.

The design approach behind this rethink of the design assessment framework is inclusive design. This chapter highlights the differences between a set of assessment methods and discusses their usefulness to the evaluation of ease of use (with special emphasis on usability and accessibility) throughout the design process. The aim is to support designers to perform an informed choice of the most appropriate assessment method(s) for any given circumstance. Ultimately, the aim is to encourage designers to be permanently aware of the usability and accessibility implications of every single decision they make, avoiding causing unnecessary discomfort or exclusion to a wide range of potential consumers.

### Assessing practical inclusivity

The focus of assessment, as discussed here, is primarily on the usability and accessibility of everyday products and services. The objective is to support assessment of the 'practical' side of inclusivity, i.e. evaluation of the match between the user's functional and anthropometric characteristics and the capability demands of the existing product and its environment of use.

The assessment approaches discussed in this chapter do not address the evaluation or quantification of issues regarding aesthetic or emotional acceptability. However, the methods should allow designers to go beyond the typical usability and accessibility evaluation and afford some insight as to how these functional capability factors can be creatively and feasibly combined with social acceptability issues, such as desirability, pleasure and affection.

Such social acceptability issues address the overall user motivation when selecting, buying, using and engaging with a certain product or service, and are crucial factors in the ultimate acceptability of the design. It is possible to assess the practical acceptability of the design,

provided that designers adopt more rigorous and empathic approaches regarding users that they are less familiar with. Thorough and knowledgeable assessments can support designers' creative expertise and increase the opportunities to go beyond existing mainstream design solutions.

### Selecting the right users

To achieve reliable and useful results, many assessment methods require the participation of 'representative' users of the intended target population. It has been argued, though, that it can be difficult to identify and recruit representative users (Norris and Wilson, 1999).

It has further been said that it might not be necessary to spend so much effort looking for representative users, since particular interesting users can provide design inspiration if one knows how to look for it. An interesting user is someone that has some particular characteristics that can contribute to the problem being addressed and ultimately be integrated into the final included population.

For mainstream design it can be relatively simple to learn about the functional profiles of the target users, because there are many of them and they usually have homogeneous capability profiles. However, inclusive design approaches aim to expand the boundaries of mainstream design to include other users with a wider variety of functional capability profiles. While 'non-mainstream' users are numerically frequent as a whole, they are also, by definition, heterogeneous.

Consequently, the broad umbrella description 'non-mainstream' applies to a multitude of different user sub-groups. Each of these sub-groups exhibits its own unique characteristics and is often significantly different to the others. Consequently, rather than a single large population group to draw representative users from, there are many smaller groups, each representing fewer people.

Thus, the designer is faced with the two-fold difficulty of deciding which users to choose from within each sub-group and which sub-groups to address. In addition, it is difficult to know whether the selected users are representative of the intended target population (and their subgroup), or if this sample is complete in terms of including all the users that could potentially benefit from a commercially feasible design.



## An independent functional capability scale

One way to overcome problems with identification, sampling and completeness of non-mainstream users is to map their functional profile onto an independent functional capability scale. The Office of National Statistics (ONS) population scales (Martin et al., 1998), describe a way of categorising the users' motor, sensory and cognitive capabilities using thirteen functional capabilities, of which seven are particularly relevant when considering user-product interaction, namely:

- Motor – locomotion, reach and stretch, and dexterity.
- Sensory – vision and hearing.
- Cognitive – communication and intellectual functioning.

One of the advantages of using the ONS scales is the potential to use the scale descriptions in the assessment of everyday products and to translate the results into how many people could be affected by a particular design solution or feature. However, assessment methods can be used without necessarily relating the evaluation results to numbers of people affected.

Such independent scale also takes into account the user's actual range and level of functional capabilities, rather than simply their medical diagnosis. What are used are descriptions of what the user can and cannot do, rather than the medical cause of their impairment. For instance, it is not very helpful for the designer to know that certain users have 'arthritis of the knee joint', unless they have the appropriate medical expertise to interpret that diagnosis. Instead it is more useful to know how long the user can stand or walk or how many steps the user can climb.

This kind of information is unambiguous and thus easier to incorporate into design decisions. Designers are more receptive to learning about possibilities when dealing with less familiar areas, rather than vague and obscure terminologies or constraints. Therefore, the evaluation of usability and accessibility is considered from the viewpoint of an independent functional capability scale, where the product or service interaction will be defined and assessed in terms the absolute motor, sensory and cognitive levels of capability required to use the design.

Comparative benchmark assessments allow designers to know if the solution being developed is better (or worse) than a competitor's one, it does not provide further information about how much its inclusivity has improved over previous designs. It would be more useful to know how far the present design is from the 'ideal' solution (i.e. something that includes everyone in the intended target population).

A more effective evaluation of the existing design exclusion suggests that quantitative feedback could give designers a more accurate picture of the level of inclusivity of their designs.

### **A framework for assessment**

Whilst some design companies adopt methodologies that advocate a major assessment activity at the end of the design process, what is needed is an iterative cycle of evaluation that the designer applies throughout the creative process. Inadequate and late evaluations often result in poor reactive adaptations to flawed interfaces, rather than genuinely inclusive designs. Typically, time and cost constraints imposed on design manufacture makes it unfeasible to retool the manufacturing process to perform changes on the existing design at this stage. Thus the final design may have cumbersome and unattractive features that have been 'fixed' to meet inclusivity requirements, instead of being designed proactively from the outset.

Suggesting one single rigid framework of methods for the assessment of product inclusivity, would be contradicting the basic ethos of inclusivity, by limiting designers to a narrow set of choices. Equally, different companies have their own approaches to design, and so methods that are useful for some may be difficult for others to implement. In addition, it would be overly optimistic to assume that one method of assessment alone could provide all the necessary answers about the wider range of end-users. Assessment tools to support the assessment of product inclusivity should be straightforward, fast and economic to implement. Assessment techniques have to be developed with designers in mind, by being practical and efficient, as well as appealing and inspiring.

A flexible balanced framework of different assessment methods is more likely to meet designers' needs and enhance design inclusivity. The objectives include the implementation of a variety of methods that, with or without direct user involvement, provide designers with insight



into potential user exclusion that may arise from arbitrary design decisions. It should also encourage designers to be aware of their own knowledge limitations about the wider range of end-users. Despite designers' experience and expertise, evaluating product inclusivity adequately involves a plethora of variables that are often outside the designers' mind-set. In the same way that it is not possible, for instance, to commit to memory all the users' anthropometric characteristics, it seems unlikely that it will be possible to memorise their diverse functional capabilities.

### A review of some common assessment methods

There are many design methods and techniques reported in the literature (Wilson and Corlett, 1995). It has been found, however, that apart from designers' common self-observation approach, user observation, interviews, user trials, questionnaires, checklists and expert appraisal are among the most popular and common methods used (Stanton and Young, 1998). This preference is partially consistent with results obtained from interviews with eight British design consultancies about their inclusive design practices (Dong et al., 2002).

Several of those companies identified user forums, a combination between user trials and interviews, as very useful and inspiring. During the user forum sessions, the designers were active interviewers and the users tried several products and talked about problems they frequently experienced with solutions already on the market. Other companies described user observation as an enlightening way of finding out more about the interaction between the user, the products and their surroundings. Some companies expressed their interest in expert appraisal, where someone expert in disability, or a specific field such as ergonomics, is brought in to provide an assessment of existing products.

Other companies identified tools, such as simulators, as possible methods to be used for identifying usability and accessibility difficulties with their products. It was suggested that simulation could be a quick and attractive assessment method to allow designers to gain a better understanding of symptoms associated with certain impairments.

The methods discussed in this chapter can be implemented at different stages of the design process. Some are easier to implement,

others take longer or involve extra time and other resources to organise.

All the methods provide different forms of assessment results.

This chapter examines the following assessment methods in detail: systematic approach; user observation coupled with interviews; user trials coupled with questionnaires; checklists and guidelines; simulation; and expert appraisal. Although some of the methods discussed in this chapter are presented in conjunction with another method, each can be implemented as an independent method per se.

## Systematic approach

An alternative to the self-observation assessment approach that designers usually carry out using their own intuition and daily experience, is a systematic and structured approach to design assessment (Cardoso et al., 2002). The aim is to scrutinise and capture, in increasing levels of detail, the sequence of functional capabilities that may be needed during user-device interaction.

The approach can be enhanced, for example, with the use of task-analysis or link-analysis techniques (Stanton and Young, 1999). The procedure starts with the definition of the overall goal(s) that is(are) expected to be achieved by using the product, until the possible sequence(s) of functional capability constituent steps that compose the interaction are identified. Information on user functional capabilities (e.g. Martin et al., 1998) or physical attributes (e.g. Smith et al., 2000) can be used to build up the vocabulary that describes the interaction.

The systematic approach requires the designer to consider possible sequences of interaction in detail. One way to annotate the interaction narrative is to construct a graphical map of the interaction where, after defining the overall goal and possible contexts of use, the designer builds up the sequence of motor, sensory and cognitive constituent actions taking place. In addition, for each constituent action the product features (e.g. handles, weight, switches), product surroundings (e.g. furniture, cupboards, stairs) and the environmental influences (e.g. level of luminosity, thermal and auditory conditions) involved are identified. Even without user involvement, the designer can identify how certain constituent actions could be carried out if the user could not perform the action the way it was expected.

Alternatively, different sequences of interaction can be conceived by exploring possible chains of constituent actions that the product(s)



would allow users to perform, beyond the expected use. Such structured brainstorming could give designers insight into ‘coping’ strategies, which would probably be overlooked using random and informal assessments.

Once a representation of the interaction is developed, the next step is to go through the interaction narrative and assess the demands upon the user. The ONS scales represent one way forward, with the advantage of relating the interaction demands to an estimate of the number of users affected. Other assessment criteria involve identifying the frequency and severity of certain problems encountered during the interaction. Without relating the product demands to the number of possible users affected, it can be difficult to decide which problems should be given priority. Despite the level of detail of a map of the interaction, it is important to be aware that it will only represent a subset of all the ways of performing certain tasks.

The map of the interaction can be improved and extended continuously throughout the design process using information gathered from other assessment methods. The systematic approach allows designers to have an up-to-date storyboard of the likely interactions. The main goals of a systematic approach are to increase the validity of evaluation by systematising the designers’ typical self-observation approach and minimising the possibility of overlooking any particular aspect of the interaction.

## User observation and interviews

User observation involves watching people’s behaviour when interacting with products or services in real-life environments, for instance at home, in their workplace, or in a controlled environmental setting such as a usability laboratory. The observer is usually present, yet as ‘invisible’ as possible throughout the interaction, capturing the events taking place.

Observation of the interaction can either be annotated in written format, audio-taped, or video-recorded. The latter method may or may not involve the observer’s presence. This method has higher validity since the observer has the opportunity to observe the users directly in a ‘non-intrusive’ manner. However, despite the degree of validity of the method, it must be noted that the users may perform differently when they know they are being observed. At the end of the observation

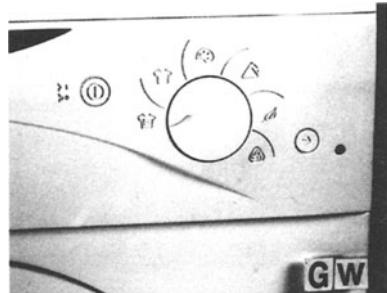
session, interviews can be employed to clarify and consolidate the observed events.

User observation involves watching an observable sequence of actions that the user performs when interacting with the product. To increase the chances of achieving reliable and valid information with this method, it is important ensure that the users are comfortable with the procedures and aware that what is being tested is eventual difficulties caused by poorly designed attributes and not the users themselves. User observation should be adequately structured so as to enable the classification of the observed behaviour into specific categories, rather than relying solely on the observer's interpretation of the actions.

Observing users in real-life settings can provide insight into particular contextual circumstances or environmental influences. In addition, if users are encouraged to verbalise their thinking process during the interaction, it helps the observer to learn more about behaviour that is not easily observable, for example regarding the usability, the user's motivation or social acceptability issues. Speaking throughout the interaction is known as the 'Thinking Aloud' protocol (Nielsen, 1993). Although very useful, it is important to be aware that it may encourage interaction practices that differ from those expected in normal use, when users will not go through the rigour of verbalising their thought processes.

Usability and accessibility mismatches occurring with everyday interfaces can be captured through user observation. Such mismatches can lead, for instance, to coping strategies that are adopted by the user to help perform a certain task. Sliding heavy objects that were intended to be lifted and using scissors to open packaging that were supposed to be opened by hand are examples of some of these strategies.

However, coping strategies are not always straightforward to capture through direct observation. Some users may become used to coping with certain design faults, making it difficult for the observer to identify where the problems lie. On the other hand, situations where the user is apparently coping with a certain feature may in truth not represent a significant difficulty. For instance, the user may handle a particular object with two hands, when the expected behaviour was to do it only with one hand, suggesting that the object might be too heavy. However, in reality the object might not be particularly heavy



and the user just wants extra accuracy when performing a particular task. The thinking aloud protocol can help clarify such situations.

Alternatively, the observer can ask the participant to clarify any questions that arise during the observation.

User observation allows the designer to learn more about the validity of their expectations, concerning user-product interaction, and find out what actually happens when people with diverse characteristics use a particular design. Coping strategies in particular may reveal features that the user has difficulty using. Any difficulties observed can be related to the seven functional capability scales discussed earlier, and it is possible to start quantifying the levels of capability demanded by the product.

At the same time, by observing different users, it is possible to build specific user profiles and map their functional capabilities on the scales. Such mapping is useful for later reference throughout the project when it is not feasible to involve users. The capability scale also enables the designer to be aware that some capability impairments might be over-represented or under-represented during user observations.

User observations can be performed at milestones in the design process when more realistic assessments are needed. Although user observation is usually carried out when a model or prototype is available, it can also be very useful at the early stages of the design process, when designers are still trying to understand the implications of the problem they want to resolve. Observing several users carrying out the same kind of task, or using similar products, for instance, increases the chances of identifying potential problems very early in the design process.

The main disadvantages of this method are the time and cost involved in preparing the user observation sessions and analysing the results. Although user observation can be reasonably straightforward to carry out once it is planned, it can take a considerable amount of time to organise. Special considerations, such as recruiting 'representative' users, or applying for ethical approval to carry out such studies, can be a time-consuming process. Analysing the data collected can be complex and time-consuming as well, due to the amount of information that can typically be gathered.

Despite the time and cost constraints involved in watching users behaviour, user observation coupled with interviews, form a strong

combination of techniques that can provide designers with important information about the overall acceptability of their designs.

### User trials and questionnaires

In user trials, users are provided with the product and asked to test it, but are not necessarily observed while doing so. Feedback from user trials originates from the users themselves, often in the format of questionnaires as well as interviews. The trial sessions can either take place in a controlled, experimental setting (e.g. in a laboratory), or where the product is supposed to be used (e.g. the user's home). This method has the advantage of a more 'natural' interaction since the user is not being observed while using the products. However, the quality of the feedback will depend on the users understanding the objectives of the trial and providing their complete and honest opinions.

Users can be asked to note down specific comments regarding the product being assessed. Alongside the product(s) being evaluated, the user is provided with a questionnaire that addresses particular issues regarding the ease of use of the product. Users in general, and particularly older users, tend to either underestimate or overestimate their own functional performance and questionnaires are therefore of limited use for gaining additional feedback. However, if emphasis is put on the problems that the design presents, it might be possible to get a more objective response from the users.

Users can be asked about the difficulties that they experienced with particular design attributes, features, actions or sequence of actions. Alternatively, they can be asked about the most demanding action for each functional capability. User trial questionnaires should be structured to extract the most relevant information about the types and levels of capabilities required to interact with the device under evaluation. Nevertheless, despite the pre-structuring of questions, users should also be encouraged to add any comments they have, which may not have been addressed by the questionnaire.

This method is usually applied when there is a working model or prototype of the product being developed. However, similar to user observation, user trials can be carried out during problem definition phases using existing products available on the market. This method has the advantage of providing first-hand opinion from the people who will actually be using the product. User trials can be carried

out formally, using controlled experiments and statistical analysis techniques. However, it seems unrealistic to expect that designers will be interested in carrying out such complex assessments. Studies carried out in design education report the success of involving small groups of users and running simple user trials to provide insight into user-device interaction. This kind of user involvement was also highlighted by eight British design consultancies as a very valuable input for inclusive design practices (Dong et al., 2002). Post-user trial interviews can be used to clarify any unclear comments or circumstances of interaction.

The cost and resources required to run a user trial will vary according to the number of participants involved, the number of products being tested and the complexity of those products. It can be difficult to identify and recruit typical end-users for the product being developed. Specialist organisations exist to perform user trials and they can be contracted to carry out the assessment or be used for access to users.

## Checklists and guidelines

Checklists and guidelines are based on information that represents design issues (e.g. ISO, BSI) or specific information about users (e.g. population data). Checklists can be used to stimulate ideas reminding the assessor about a variety of issues that may not have been given proper consideration. Guidelines provide more specific information about, for example, legislative safety issues or user physical attributes, such as anthropometric measures (Smith et al., 2000).

Although there is no single inclusive design checklist, some general guidelines exist that afford insight into issues that should be considered when designing for a wider population. Common checklists and guidelines may not be interpreted as assessment methods per se, but can provide some basic aid if usability and accessibility issues are to be addressed. Due to their pre-defined composition, checklists and guidelines may not be suitable if a designer is developing, for example, a completely new product for which there is no previous information available.

Depending on the knowledge and skill of the assessor, checklists, can be adapted and modified to particular evaluations. However, such adaptability may cause variability in checklist analysis (Stanton and Young, 1998). Anthropometric guidelines in particular are important

for the evaluation of specific interaction demands on the user. The variation and combination of the product feature dimensions has implications on the required user anthropometric characteristics, which in turn will influence the functional capability profiles supported. For example, depending on the dimensions, location and mechanism of a handle on a door, it is likely that different levels of dexterity, reach and stretch and, possibly, vision capabilities, will be required to use it.

Instead of using checklists that are product- or feature-dependent, a capability scale checklist, e.g. the ONS capability scale (Martin et al., 1998), can provide a general basis for assessing a product's functional demands. Capability scales checklists based on population data offer the potential to quantify the number of people who may have difficulty with the product.

Although, checklists and guidelines can be used at all stages of the design process, at present there is a lack of 'inspiring' inclusive design checklists and guidelines.



## Simulation

Simulation involves designers using physical simulators to 'reproduce' physical impairments. For example, the designer can use simulators that restrict movement in key parts of the body. While motor and sensory impairments are easier to simulate, it is difficult to simulate cognitive impairments. Simulation also allows the reproduction of combinations of different functional impairments.

Simulation is probably one of the most attractive assessment methods designers can use due to the immediacy of the experience. It allows designers to feel usability and accessibility limitations physically while interacting with the product. An interesting example of this tool is the 'Third-Age Suit' developed by Ford Motor Co. in conjunction with the University of Loughborough (Steinfeld and Steinfeld, 2001). The suit simulates the physical impairments of older adults, restricting body movement in locations such as elbows, knees, neck, stomach and back. It also has special gloves and goggles to reduce the sense of touch and vision, respectively. This device has been helping Ford's designers to understand and anticipate the special driving requirements of their older customers.

A simulation resource kit offers the benefit of being particularly useful if a quick product test is required. If reasonably calibrated against

some of the common impairments real users might have, it works like a ‘scale’ or ‘ruler’ that the designer can use to find the most critical problems with the user-product interaction. The toolkit could be used more frequently throughout the process when access to real users is not possible.

While more precise impairments (such as blindness, use of one hand only and wheelchair use) are easier to calibrate and simulate; more imprecise impairments (such as difficulties in bending, or reaching) are more complex to match to the real level of impairment. In addition, any simulation, in spite of being a useful way of experiencing the symptoms of impairment, does not allow the designer to fully understand the consequences of being constantly impaired and is limited in its fidelity. A person who experiences real disabilities may have lived with that problem for a long time and they may have developed coping strategies that the designer would probably not predict even if using a very accurate simulator.



### Expert appraisal

Expert appraisal is the evaluation of a product or service by someone who has professional training or experience to make an informed judgement on the design. It is a valuable method for providing analyses that identify areas for improvement. Assessment techniques such as heuristic evaluation and cognitive walkthrough, originally developed for human-computer interaction, can provide a basis for the assessment of inclusivity.

Expert appraisal uses the understanding and knowledge of an individual or group of individuals, often from outside the design team. Experts include usability professionals, engineers, other designers, experts in particular environments, existing users (usually defined as expert users), carers and so forth. It is likely that the experts will have their own modus operandi for assessments, thus the seven capability scales approach discussed earlier in this chapter might not be of relevance.

This method of assessment is usually used to detect critical problems before the product is released for more thorough, and often more expensive, appraisal. However, the method can be applied at any stage of the design process. Expert appraisal depends on the availability of the experts, their knowledge of the users and of the circumstances

of the interaction. It is preferable to have an internal user champion present throughout the design process, rather than external 'hired help' who may only be contracted in for occasional assessments.

This raises an interesting issue about whether designers should become experts in assessing inclusivity thus avoiding the need for external expert consultants. Designers are expert at designing solutions to existing problems, but not necessarily experts in performing particular assessments on the product being developed. However, it may be possible that by adopting more systematic approaches to inclusive design evaluation, designers themselves reinforce their professional expertise by incorporating thorough assessment procedures in the same way that they apply creative and inspiring ideas when designing.

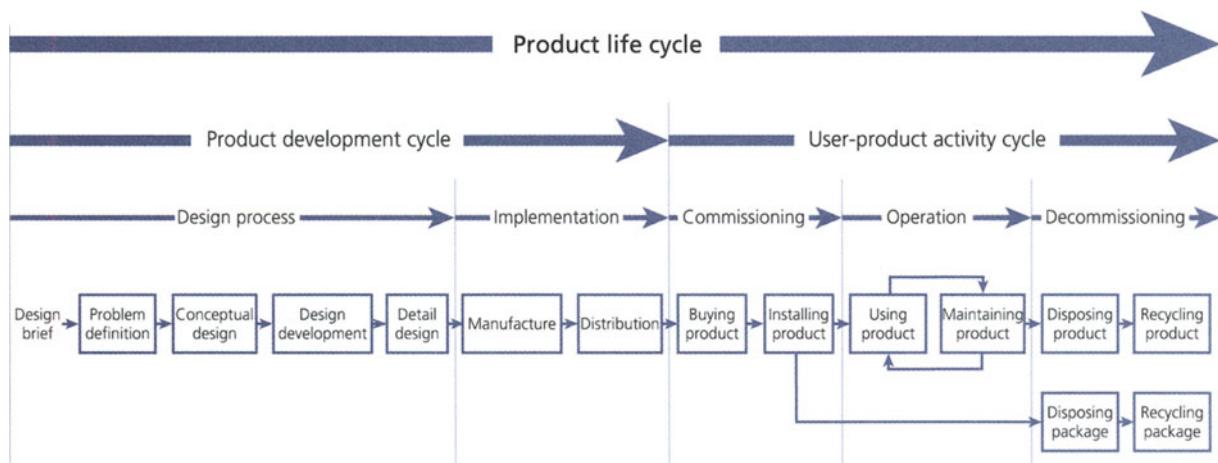
Since expert appraisal will depend on the background of the assessor and the evaluation procedures adopted, achieving reliable results often requires the participation of several experts, so that different perspectives and problems can be identified. If the experts are from an outside research consultancy, it can become expensive for the design company to contract their services.

## Context of assessment

When usability and accessibility assessment methods are usually performed, they focus on the evaluation of the actual use of the product for its principal functional purpose (i.e. product operation). However, design disablement or exclusion, can also happen at less evident levels

### 27.1 Product life cycle

A map of the product development and user-product activity cycles.



of the user-product activity cycle (Figure 27.1), for example when products are unpacked and installed.

Occupational therapy theories describe ways of measuring user independence as the capacity to perform functional tasks necessary to meet the demands of daily life. These activities of daily living (ADLs) are categorised into basic and higher level ADLs. The basic ADLs are those that are necessary for individuals to care for themselves within a limited environment (e.g. eating and dressing). Higher-level, or Instrumental, ADLs (IADLs) are those activities necessary to function in the community (e.g. using a phone, paying bills and shopping). Although people of all ages may have problems with IADLs, prevalence rates are much higher for people with impairments or with decreasing functional skills, such as often associated with the ageing process.

In IADLs, a large number of devices are used to support the efficient, comfortable and pleasant fulfilment of a variety of everyday tasks. However, the majority of those devices, particularly the ones used in domestic environments, have usability and accessibility shortcomings for people who are not fully able-bodied.

Figure 27.1, which represents a product life-cycle, shows how the different cycle stages are grouped hierarchically. From the viewpoint of sustainability, it has been widely discussed how important it is to consider the entire product life-cycle in the design process. However, most design activities focus on the operation stage (i.e. using the product) and not so much on other important stages of the user-product activity cycle.

Equally, it is important to consider a wider environmental context and evaluate the impact that other stages of the user-product activity cycle may have upon the user. Certain stages of the user-product activity cycle may cause higher levels of exclusion than the operation stages. The commissioning stage, for instance, involves buying the product (i.e. looking for, selecting, and transporting the product) and installing it (i.e. unpacking, assembling, and connecting it to power, etc.) may present serious problems to many people. Likewise, within product operation, the maintenance stage can sometimes be difficult to carry out, irrespective of whether the product is generally easy to use.

Consequently, inclusive assessment strategies should be implemented throughout the design process to enable adequate

usability and accessibility evaluation and prevent from unnecessary discomfort or exclusion in stages of the user-product activity cycle conventionally considered less important.

## Summary of the assessment methods

The methods presented here can be implemented at different stages during the design process. The stage of the design process, the form that the product takes, access to end-users and pressure of time and other resources (Stanton and Baber, 1996) will determine when and where the methods will be implemented.

Combining the various methods can enhance the assessment of design inclusivity. Methods that are likely to be more time-consuming and expensive (e.g. user observation, user trials and expert appraisal) can be applied at key milestones of the design for additional feedback, while others (e.g. systematic approach, simulation, questionnaires, interviews, checklists and guidelines), can be used for frequent, quick assessments. For the purposes of the methods reviewed here, the design process can be summarised as being a four-stage process (Table 27.2, overleaf):

- *Problem definition:* usually, at this stage the design team and the client have reached an agreement concerning the interpretation of the brief. Viewing the brief as a set of requirements and constraints, the designer tries to understand the implications of the problem being addressed for the intended target audience.
- *Conceptual design:* ideas for possible solutions to the problem identified are usually built in an informal manner using brainstorm techniques and, whenever possible, involving professionals from different backgrounds. Conceptual designs can take the form, for instance, of mood boards, user scenarios, or conceptual sketches.
- *Design development:* several potential concepts become formalised and 3D computer animated or model making techniques are used. Depending on how frequently the design team has to report to the client, the end of this stage should narrow down to one, or maybe two potential solutions.
- *Detail design:* the design solution becomes defined, prototype(s) built for evaluation and technical drawings are developed. All the technicalities have been fully defined and the product is ready for manufacture.

## 27.2 Product assessment

Assessment methods can be used at all stages of the design process.

| Problem definition  | Conceptual design        | Design development       | Detail design            |
|---------------------|--------------------------|--------------------------|--------------------------|
| Systematic approach | Systematic approach      | Systematic approach      | Systematic approach      |
| Observation         |                          | Observation              | Observation              |
| Interviews          | Interviews               | Interviews               | Interviews               |
| User trials         |                          | User trials              | User trials              |
| Questionnaires      | Questionnaires           | Questionnaires           | Questionnaires           |
|                     | Checklist and guidelines | Checklist and guidelines | Checklist and guidelines |
| Simulation          | Simulation               | Simulation               | Simulation               |
| Expert appraisal    | Expert appraisal         | Expert appraisal         | Expert appraisal         |

Table 27.2 presents a summary of where the assessment methods can be implemented within the design process. This is not meant to be a recipe for assessment, since different companies have different design procedures. Instead the objective is to show that these are some of the methods that can support the designer to acquire more empathic and robust knowledge about all the potential users who may want to use a particular product or service. It also suggests that adopting approaches that implement assessments only towards the end of the project are insufficient. The ultimate decision of which assessment methods to use and when to use them, will depend on the design team and the company strategy. On the other hand, if the client is not conversant with the need for more thorough and realistic assessments, it is unlikely that the design consultancy will be allocated the financial resources necessary to do it.

## Summary

The methods discussed here are not aimed at telling designers what and how to design, rather to show the potential and importance for increasing the objectivity and realism of assessments throughout the design process. Designing creative and innovative solutions to the problems identified is the responsibility of the designers. The assessment methods should support and encourage designers to be intuitively aware of the scope for expanding the use of their design to users who are usually disadvantaged from using them.

Ultimately, designers should question and challenge their preconceptions about how users behave and what sort of user involvement they expect and wish for. Designers should extend the diversity of information they consider and not be limited to the typical self-observation approach or the usual tendency to apply two or three favourite methods, irrespective of the design problem being addressed (Stanton and Young, 1998; Baber and Mirza, 1998). Combining different assessment methods should challenge designers to go beyond common poorly re-designed solutions that overpopulate the design market.

## Acknowledgements

Chapter title page image: Roger Coleman

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This section explores specific responses to the inclusive design challenge.

An important concept – the empathic design model – is introduced in a paper by Roger Coleman, Cherie Lebon and Jeremy Myerson which describes how young graduates at the Royal College of Art have been teamed with critical users on a programme of industry-facing R&D projects.

Coleman and Lebon follow this up with a discussion of the development of tools and guidance for designers, distilling the experiences of working with both students and professionals into a set of resources for the design community. Martin Bontoft and Graham Pullin of IDEO, meanwhile, explore the precise characteristics of an inclusive design process, recognising that all of us are at some point challenged by the poor usability of everyday products and explaining ways to prototype experiences.

In the final chapter of this section, Julia Cassim and Hua Dong look at the lessons of an innovative collaboration with member firms of the Design Business Association to generate inclusive design exemplars in areas such as packaging, transport and environments. Again, empathic designer relationships with critical users deliver results.

## Chapter 28

# Design and empathy

**Roger Coleman, Cherie Lebon and Jeremy Myerson**  
Royal College of Art



Over the past ten years, at the Royal College of Art, a body of knowledge has been built up around the practice of working closely with older and disabled users, and good evidence has emerged of the impact this has on the thinking of young designers, and the extent to which that is carried through into professional practice. The process has been one of learning by doing, and the underlying ideas are very straightforward, but the value lies in the impact this has on design outcomes and the extent to which it has prompted mould-breaking work, and driven the shift in thinking and practice, from technical aids and assistive devices to inclusive design. There are many caveats to the process, and issues about which users to work with, how to go about that, and whether or not such relationships are exploitative. But overall, what has been learnt is that given appropriate, supporting information and methodologies, and access to a well-organised and representative network of users, the process can be very effective.

## Beyond ergonomics

Young designers, and in particular students, tend to design for themselves and their peers. College projects may feature older or disabled people, but the focus is normally on special needs rather than lifestyle and aspirations. Young students rarely have close or extended contact with such people, and so the results tend to reinforce stereotypes. This reflects a significant gap between mainstream design interest in the psychological and emotional factors that motivate purchasing decisions, and the compensatory aids and adaptations offered to older and disabled people. The result is a tendency to further marginalise people by treating them as somehow different, and more prosaic in their needs, and by failing to recognise their market potential as consumers, and their aspiration to be treated as part of the mainstream.

The challenge for design, and in particular for young designers, is to bridge that gap and begin to understand that people outside their peer groups have very similar and complex mixes of lifestyle and emotional needs. If concern and insight can be applied to creating products and services that offer marginalised groups the same delight in use that mainstream designs set out to achieve, then the concept of inclusion can be extended beyond ergonomic factors that reflect medical models



User forum with U3A members.

**When given the opportunity to work with older and disabled people, young designers move rapidly towards acquiring a deeper understanding of individual desires and frustrations**



Testing a prototype shower head. Esther Perea-Borobia, RCA Industrial Design Engineering 1995.

of impairment and decline, to embrace the aspirations and social needs that we all share regardless of age or capability.

For example, when one of the authors was designing a new kitchen for a friend in a wheelchair, it emerged that what the friend desired above all else was for the neighbours to be jealous (Coleman, 2001). This realisation inverted the design priorities, by setting 'normal' desires and identity factors on a par with the ergonomic factors, and in many senses over and above them. If the ergonomic factors are ignored or not adequately solved then the design will fail, but the key to success lies beyond the quality of the 'fit' with the user's capabilities. Equally important is the emotional fit with the desires of the user, and it is the marriage of physical and emotional fit that is the ultimate goal.

Young designers are highly sensitised to the desires and aspirations of their peers, but, quite understandably, lack the same empathy with other people because they have little contact with them. What is encouraging, however, is that when given the opportunity to work with older and disabled people, young designers move rapidly towards acquiring a deeper understanding of individual desires and frustrations. Close contact leads to an empathy that acts as a spur to creativity. Young designers enjoy the experience, and derive considerable satisfaction from feeling they have done something useful and valuable – not worthy, but worthwhile – which chimes with a youthful concern to contribute to making the world a better place (Coleman, 97a).

### From usability to desire

Over the past 20 years, there has been a significant shift in attitudes away from the idea that 'one-size-fits-all' towards mass customisation, and a parallel shift from product to service as a focus for business activity. These changes have led to new consumer expectations, new business thinking, and new design practices. At the heart of these developments is a move away from the mechanics of problem solving and the physical aspects of design, towards the more emotional factors that motivate purchasing decisions, reinforce (or undermine) consumer satisfaction and sustain brand loyalty. This has prompted designers to take a closer interest in the quality of the user experience (Green and Jordan, 2002), while new production methods and materials technology make it increasingly possible to think in terms of personalised products and services. A further impact of technological

change has been the need to ensure that products, services, and in particular interfaces, are intuitive to understand and easy to use. As a result, user-centred design, as advanced by Nielsen, Norman and others, has emerged as an important strand of contemporary design practice, while more radical thinkers like Victor Papanek, have advanced ideas about how design should respond to social concerns by serving human needs rather than corporate profitability.

Not only have these shifts opened up the possibility of thinking in terms of a closer fit between individuals and their environment, they have also prompted an interest in what makes people 'tick' and the full gamut of factors that influence choice and the way we interact with products and each other. This has been accompanied by an increased interest in ways of understanding and researching users that can tease out the emotional, cultural and aspirational factors that are at the heart of this new thinking about what makes for good design. As Davin Stowell, director of the New York consultancy Smart Design, asserts: "it is the design of experiences and the emotional response to the experience delivered by the product that really matters now." The important thing here is for designers to find ways to empathise with the people they are designing for, to try and get under their skins and tap into their feelings as a source of insight and inspiration. For all these reasons the team at Smart Design likes to work 'hands-on' with users, and focus on what they want to do, not on what the product can do or should do.

This is a significant extension of the more conventional concept of 'requirements capture' as a key step in the design process, because it shifts the emphasis beyond the 'hard' factors that engineering, ergonomics, and much product design has concentrated on, to include 'softer' human factors that require a different approach to user research. The value of this type of thinking and the methodologies that support it can be demonstrated by the success of companies like IDEO and Smart Design, that have embedded it at the heart of their design processes. A classic example of the outcome of such a process, and an icon of inclusive design, is the Good Grips™ range of kitchen equipment.

**It is the design of experiences and the emotional response to the experience delivered by the product that really matters now**



Good Grips kitchen tools.

## Immersive experience

A member of the Good Grips project team, Patricia Moore conducted an influential piece of empathetic research when working as a young

designer in the New York office of famous industrial designer, Raymond Loewy. Working in a predominantly male office, Moore's investigation (Moore, 85) in many senses marks the beginning of a shift in design thinking away from hard anthropometric data and overt styling towards a softer and more human-centred approach in which emotional factors and diverse capabilities come to the fore. Touched by the suffering her grandmother went through as arthritis undermined her independence, Patricia Moore was prompted to undertake a unique immersive experience. Over a three-year period from 1979 she travelled throughout the United States and Canada, visiting over 100 towns and cities disguised as a woman in her eighties.

With her body altered to simulate the physical and sensory changes associated with ageing, she was able to respond to people, products, and environments as an older woman and find out first hand just how inhospitable the world is to older people. One of the key things that she came to realise from this extended immersion in an older persona was that the norms of ergonomics, the standards and guidelines designers work to, and the consumer profiles marketers and advertisers use are all based on a subset of 'normal' users, and do not encompass those who fall outside this category. This inevitably leads to people being marginalised and excluded by design, and effectively sets up a two-tier system, where mainstream products require aids and adaptations if those outside the norm are to use and access them. Clearly something was wrong with the set of assumptions that underpinned the design process.

As a result of her experiences she came to the view that rather than divide the world into able-bodied and disabled, it was important to recognise that we are all 'differently abled', and that our capabilities change throughout our lifetimes. There are times when all of us are disabled, and life expectancy is now such that we can all aspire to live long enough to suffer some age-related impairment as her mother did. She also realised that disability is not something people are born with or acquire through accident, illness or as a result of ageing, it is something that arises from a mismatch between the environment and their abilities. As design, good or bad, is at the heart of this relationship she reasoned that a new approach to design was necessary, one that includes rather than excludes people. She has since championed the cause of user-friendly design, and advanced these ideas with 'universal'

consumer products, and healthcare products that offer 'independence with dignity'.

### **Understand, observe, visualise...**

Patricia Moore's immersive experience proved highly influential, and the value came very much from the extended and detailed nature of the experiment, and the fact that it was undertaken as part of a postgraduate study. It stands at one extreme of the range of empathic models and methods that are open to designers, and within the reality of everyday professional life, it is rarely feasible to take this approach. Instead, practicing designers respond best to flexible approaches that give quicker insights and move them swiftly towards practical ideas that they can further test and experiment with as part of an iterative process.

Smart Design has applied similar thinking and practice to the design of many successful consumer products, but is not the only design company to succeed on the basis of an empathic approach. International design consultancy IDEO uses a sequential research and development process – understand, observe, visualise, evaluate and implement – to deliver a close fit between user needs, product functionality, visual and tactile qualities and joy in use (Moggridge, 93; Coleman, 97b). Key to this is understanding the full range of users likely to interact with a product, including sales representative, dealer, purchaser, operator, installer, end user, and service/maintenance staff. Empathic involvement with user needs and aspirations is prioritised through a range of consultation and observation methods, with ideas and concepts being developed through visualisation and scenario building. User evaluation is used at different stages to give feedback, challenge assumptions and refine scenarios of the product in use which are translated through models and prototypes into an end product which people enjoy using. This process is extremely effective in developing designs that are genuinely user-friendly, and IDEO has made a name for itself not simply as the leading independent design group in the world, but also as a company at the cutting edge of new concepts of inclusive design which can be applied equally well to specialist healthcare and personal security products and to mainstream public and domestic products and interface, as can be seen from the three chapters in this book contributed by IDEO personnel (chapters 11, 30, and 33)



Patricia Moore, as herself and in character.

**Designers learn from a direct engagement with user experience which gives insight into emotional and aspirational factors**



Plate for one-handed eating, Sabine Frank, RCA Industrial Design Engineering 1996.

## Design and social change

Similar, innovative outcomes have emerged over the past 10 years from work at the Royal College of Art which has brought industry partners and three design communities together with older and disabled users through a series of competitions, workshops, user forums, collaborations and research projects. Central to all these initiatives has been direct contact between designers and 'critical' users, where designers learn from a direct engagement with user experience which gives insight into emotional and aspirational factors, and stimulates an empathic desire to understand and respond to quality of life issues rather than just physical problems (Coleman, 97a). Work with design professionals suggests that such an approach is not only personally rewarding, but a spur to innovation and a commercial advantage (Cassim, 2001a, b, c and d). For detail on the range of information, guidance, user-research methods and other materials developed to support the design community see the next chapter, 'A designer-centred approach'.

The RCA has a long-standing interest in social issues. In 1976 it staged the Design for Need conference, organised by, among others, Industrial Designer tutors, Professor Misha Black and Frank Height, and Professor of Humanities, Christopher Cornford. The conference brought practitioners from around the world to London (Bicknell, McQuisten, 77). Subjects ranged from ecology, environmental policy and the recycling of materials, to self-build housing, workplace design, designing out disability, equipment for emergencies and disasters, and beyond that to design education in developing countries. Two of the closing papers brought the overall thrust of the conference into sharp focus. Mike Cooley talked about 'Design for Social Use', and Victor Papanek's subject was 'Because People Count: Twelve Methodologies for Action'. Both argued for a shift in emphasis from designer to user, and from the individual artefact to the broader social context of design.

Frank Height, as senior tutor in Industrial Design, was concerned by the growing gulf between the two cultures of engineering and industrial design, with its origins in the art schools not the universities. The solution that he finally homed in on was to establish a joint postgraduate course with Imperial College in Industrial Design Engineering (IDE). The objective was two-fold, first to produce a new cadre of designers who could combine the visual and imaginative

skills of arts trained designers with the technological and scientific understanding that came from the engineering tradition; and second, to respond to some of the important issues thrown up by Design for Need and other related initiatives. Since it was launched in 1980, a strong focus on user-centred design has underpinned the IDE course at the RCA, and out of this rare combination of innovative design, technological depth and user-involvement has come a stream of high-quality socially responsive designs, many of which can be seen on the IDE website at [www.ide.rca.ac.uk/](http://www.ide.rca.ac.uk/)

This concern with the social aspects of design has been further developed through a collaboration between the Helen Hamlyn Foundation and the RCA, which built on the seminal exhibition 'New Design for Old', organised and curated by the Foundation, at the Victoria and Albert Museum in London in 1986 (Manley, 86). An international team of designers produced a collection of furniture, clothing, consumer-durables, bathroom and kitchen fittings, door furniture, and personal items, demonstrating that addressing the needs of older people could be a route to innovation, and that lessons learned from one sector of society could be applied to design as a whole.

The next step was DesignAge, an action-research programme exploring the implications for design of ageing populations. This presented a unique opportunity to take ideas from the margins to the mainstream of design thinking and practice. Because DesignAge was not a teaching programme, it could develop as a cross-disciplinary activity engaging with postgraduate students from fashion and textiles to vehicle design, and from photography to industrial design and engineering (Coleman, 94).

The theme of the programme 'design for our future selves' was chosen to encourage young designers to engage with ageing as a natural part of the life-course, focusing not on older people *per se*, but on how they saw themselves in the future. The programme concentrated on the convergence between social and commercial imperatives, on arguing the case for age-friendly design, and on encouraging industry and the design profession to recognise the opportunities offered by an older consumer market. It has done this by bringing together factual and trends information, along with design relevant tools and guidance (Coleman, 99). The results have included exhibitions, conferences, competitions, new designs and products,



User forum with U3A members.

**Bringing older users into the college gives design students an opportunity to talk through ideas, develop concepts, and later test prototypes**



A jar we can open, Gavin Pryke, RCA Ceramics and Glass 1994.

publications and a growing body of information about the subject gathered together in a special collection at the RCA.

A central thrust of the programme has been to encourage young designers to work directly with older people. This has been achieved through a collaboration with the University of the Third Age (U3A), a fast-growing and self-organised association of retired people. U3A members attend regular User Forums at the RCA, where they meet students, participate in focus groups and other research activities, and discuss consumer issues with professional designers and industry managers (Coleman, 1997a). Bringing older users into the college gives design students an opportunity to talk through ideas, develop concepts, and later test prototypes and research specific issues of styling, aesthetics and usability. The RCA students and U3A members build up a high degree of trust, and all find the experience interesting and enjoyable. This interaction with older consumers gives students a rapid insight into how to develop appropriate products and services, and into the pitfalls that await them if their approach can be seen to be in the least patronising. Alongside working with older users, an important strand of the DesignAge programme has been a regular competition open to final year MA students.

The competition began in 1994, and the many entries have served to establish a body of work that gives substance to the concept of 'design for our future selves' (Myerson, 99). The diversity of the competition projects supports this concept by demonstrating how traditional objects can be redesigned, and new concepts developed. Some of the designs represent a sense of freedom and escape, such as yachts or cars or personal floatation platforms from which to view the underwater world. But most home in on the practicalities of restricted lives, with ideas to support household chores, reading, sitting, standing and staying warm, and extending into humanising hospitals and residential care. By no means are all of the projects aimed directly at the mature market, but in tackling such issues as living alone, they bring the age issue into focus.

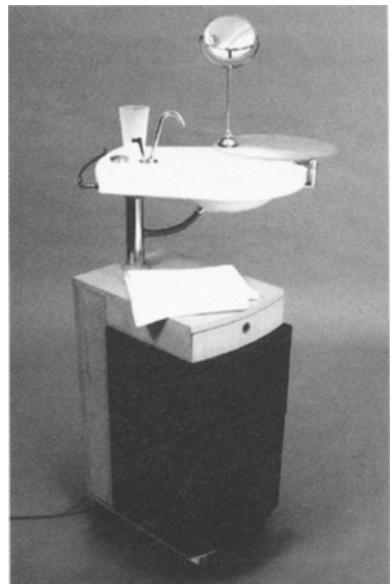
### Inclusive exemplars

From the earliest days, the competition produced exemplars that shifted the subject from the margins to the mainstream through designs that were either genuinely inclusive, or saw the opportunity to

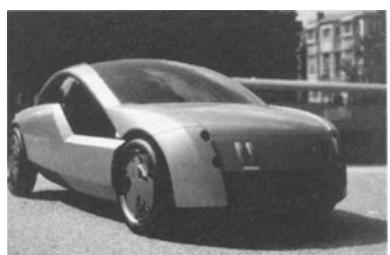
apply a solution for a specific group to the population in general. For example, Gavin Pryke's 'a jar we can open' (RCA Ceramics and Glass, 1994) effectively tackled the problems of opening and handling glass packaging, eliminating the need for extra adaptive devices. By designing to the gripping and twisting capabilities of people over 60, Gavin developed a new jar shape and a square lid, that are easier to grasp and open, and more stable with a low centre of gravity. Manufacturing and distribution issues, including labelling, packing for transit and presentation on the supermarket shelf were also successfully addressed. While Sabine Frank's 'plate for one-handed eating' (RCA Industrial Design Engineering, 1996) sought to fill a gap between good-looking porcelain dinner ware and the hospital-style plastic plates offered to elderly and disabled people. Designed to make eating food with one hand easier - to be produced in porcelain for restaurant, hospital or domestic use, or in plastic as a plate for buffet parties – the plate has an indentation, making it easier to scoop up food, and a high rim, helping secure food for cutting meat or spreading butter on bread while using one hand only.

Other projects looked at offering dignity and a degree of independence in situations where people are often disadvantaged. For example, Stephanie Kubanek's 'mobile washing unit' (RCA Design Products, 1996) is designed to help patients who have difficulty leaving their beds to wash and groom themselves. The unit consists of two tanks, one for clean and one for waste water, an instantaneous water heater, a basin, a mirror and storage space. The unit is adjustable in height and the basin can be rotated over the bed for easy access. The unit is suitable for use in hospitals, hospices, nursing homes and home care. It fosters independence in those environments where patients often feel unable to help themselves.

Some entries responded in an upbeat way to older people's lifestyle aspirations, as in Jim Das's 'third age Saab' (RCA Vehicle Design, 1996). Research showed that the average age of sports car owners is over 50. So the challenge was to create the strong emotional appeal of a traditional sports cars while improving accessibility and usability for older users. The relatively high roof line and large interior volume improves access as compared with other sports cars, while an innovative joystick control replaces the traditional steering wheel, resulting in



Mobile washing unit, Stephanie Kubanek, RCA Design Products 1996.



Third Age Saab, Jim Das, RCA Vehicle Design 1996.



Printed sound, Charles Cooke, RCA Industrial Design Engineering 1998.



Pill pusher, Hugo Glover, RCA Design Products 2002.

greater comfort and more sensitive control of the vehicle. The car's appearance was inspired by details and styling from classic Saab cars.

Over the years many entries have focused on very specific problems experienced by older people, but do so in ways that are both practical and life enhancing. That was the initial competition brief, which has been retained despite the expansion of the programme, and these entries demonstrate the commercial potential of products and services that support people in later life. For example, Charles Cooke's 'printed sound' (RCA Industrial Design Engineering, 1998) translates printed bar code-like symbols into sounds which are then played back through a small speaker. The codes can be printed or attached to the pages of books, magazines, newspapers, bills and direct mail for people who either cannot read or prefer to listen to spoken text, music or sound effects. Martin Bloomfield's 'pull the plug' (RCA Industrial Design Engineering, 1999) is a low-cost plastic strip that makes a UK power plug easy to remove from wall sockets. The coloured strip also allows for easy identification of plugs when a number of appliances are in use, as often happens with computer equipment. Hugo Glover's 'pill pusher' (RCA Design Products, 2002) greatly aids the dispensing and taking of pills, especially for users with extreme physical conditions caused by arthritis or sciatica. Blister-pack pills are the most common form of pill packaging yet can be very difficult to use for those with reduced dexterity and eyesight. This small, inexpensive plastic product makes them easy to access.

With the launch of the HHRC in 1999, the competition brief was significantly expanded, and one result of this has been the growth in projects inspired by working with younger disabled users. Again a key factor is the empathic bonding that takes place between designer and user. The resulting concepts, although starting with the needs of disabled users, focus on opening up new lifestyle opportunities for them, and in so doing often home in on commercially viable solutions for both small and larger scale enterprises. For example, 'beacon' by Rachel Abrams (RCA Computer Related Design, 2000) is a mobile phone service providing people with restricted mobility contextual information about access to public facilities in the city. The system improves access by gathering information from two sources: first, businesses sign up to be listed and give detailed information about facilities and access; second, users subscribe to Beacon through

their mobile phone service provider. A consultant helps the user register a 'profile' of their capabilities, level of independence and manoeuvrability. When the user wants to access the service, Beacon will filter the possibilities to match their request according to their profile and location. By using this service people can venture out and receive comprehensive relevant information about places they wish to visit. All they need to take with them is their mobile phone.

Another mobility project, Ben Wilson's 'hand driven trike' (RCA Design Products, 2001) was designed for an active eight-year old end-user with lower body paralysis and a desire for a machine styled like the bikes of his able-bodied friends. The overall concept, however, is for riders of all ages and abilities including those who prefer hand propulsion to use of the feet. A unique mechanism in the saddle area allows the rider to corner and steer the vehicle by moving their upper body from side to side. Ready-made high-tech components and 'street cred' styling ensure the trike's place in mainstream bike design.

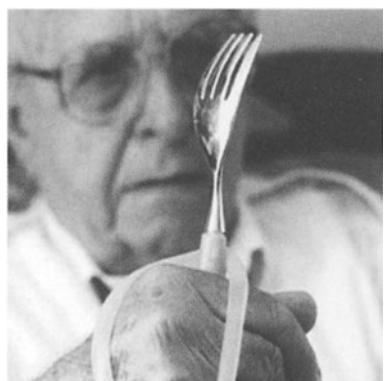
Disability is something that can affect us all at any time in our life, and often does so for limited periods of time. William Welch's adaptable cutlery (RCA Goldsmithing, Silversmithing, Metalwork and Jewellery, 2001) addresses this fact. His range of adaptable cutlery is designed for people with poor grip or restricted hand movement. The oversized handle is filled with a smart material that is responsive to human touch and moulds itself to individual user needs while the head bends sideways to optimise hand/mouth coordination. A looped strap fits over the hand and slots into the suction pad at the base of the handle. Its mainstream design aesthetic, however, makes it an attractive rather than stigmatising product, and the designer has posted Do-It-Yourself instructions on his website for making a similar but temporary product from readily available materials for those whose need for it is not permanent.

### Research narratives and an empathic model

In 1999, following on from their Masters programme, and under the newly instituted Helen Hamlyn Research Associates programme, ten RCA design graduates were teamed up with ten industry partners to undertake a range of one-year collaborative research and development projects responding to social and demographic change. In 2000, 14 RCA graduates joined the programme, a further 13 joined in 2001,



Hand driven trike, Ben Wilson, RCA Design Products 2001.



Easy grip adaptable cutlery and do-it-yourself version, William Welch, RCA Goldsmithing, Silversmithing, Metalwork and Jewellery 2001.

and a further 11 began their Research Associateships in October 2002. This has entailed working closely with a wide spectrum of users to reshape the design process to their needs. Visually impaired travellers have journeyed through Heathrow Airport; disabled teleworkers and low-paid pieceworkers have described the frustrations of working from home; older people have given feedback on supermarket labelling and domestic appliance instructions; osteoporosis patients and paraplegics have tested prototypes; and office workers have revealed the limits of balancing life and work.

Some of the outcomes of the programme are patented innovations and designed artefacts: new furniture, products and architectural structures. In other cases, design skills have been applied to the research methodology itself, as in a study which equipped flexible 'knowledge workers' with special diaries and cameras to record their working lives. In all cases, what the programme has established is that recognition and inclusion of the special and acute needs of different users in the design process lead towards better solutions for all in society, and broader markets for business.

Three research and development strands or 'narratives' been established to express aspects of inclusive design thinking. 'Age and Health' focuses on encouraging a more active and independent lifestyle among older people, and recent projects range from designing ways to make those at risk of heart disease take regular exercise, to developing tools to make it easier for older DIY (Do-It-Yourself) enthusiasts to renovate their homes. 'Working Lives' explores design issues related to changing patterns of work. These span from architectural studies looking at workspace as an agent of urban regeneration to furniture projects addressing the individual concerns of work-life balance. The third narrative is 'Urban Mobility', which explores the use of new technologies and design methods to improve mobility and wayfinding in city centres and airports.

Overall, what all these diverse projects share is an emphasis on understanding and interpreting the user experience. Under this empathic model, designers work closely with groups of users who challenge their preconceptions, open their minds and help them rapidly identify and focus on key design factors. Often working one-to-one with individual users, Research Associates rapidly bond and empathise with their users, which motivates them to develop solutions

that not only address physical issues of capability, but also engage with aspirational and lifestyle goals, enhance self-esteem and offer pleasure in use. Empathy is the key word and, when combined with creativity, it holds the promise of more popular and attractive design solutions for everyone in the future, as some brief case studies demonstrate.

### Playground – new designs for disabled teleworkers

Two social trends informed this project. First, the growth in homeworking. Second, the above-average levels of unemployment among Britain's 6.2 million disabled people, many of whom would like to participate in the UK's information economy but are prevented from doing so by lack of appropriate tools and support. After completing her MA in Design Products at the RCA, Lotta Vaananen undertook research into the habits and needs of disabled teleworkers through visits and an e-mail questionnaire. The designer then worked closely with five users in their homes to develop site-specific design briefs. These resulted in two new furniture products that illustrate a move away from hospital-style appliances for disabled people towards a more playful spirit.

Carousel is a large, horse-shoe-shaped desk designed to give wheelchair users the maximum work area from one single point, and with a turntable beneath to simulate the movement of a swivelling office chair when the wheelchair is driven onto its platform. Swing is a chair for computer users who suffer from severe back pain: it can be hung on pivot points from a support frame from different angles to change the pressure points on the body, and it has a special mattress with ergonomically designed pockets than can be filled with different materials to customise support for the neck and lumbar regions.

### Foot print – walking the way to health

Ellie Ridsdale's 'foot print' campaign to encourage people to walk their way to health, started as a design study looking at ways in which communication materials such as posters and maps can encourage people at risk of heart disease to join local walking groups and exercise regularly. In Britain, one in four men and one in five women die every year from coronary heart disease. It accounts for 135,000 deaths and costs the UK healthcare system around £1.6 billion. But just 30 minutes of moderate physical activity such as regular walking on five or more days a week will significantly reduce the risks of a heart attack.



Carousel, Lotta Vaananen 2000.



Foot print campaign poster, Ellie Ridsdale 2001.



Stepping stone, Barry Menmuir 2001.

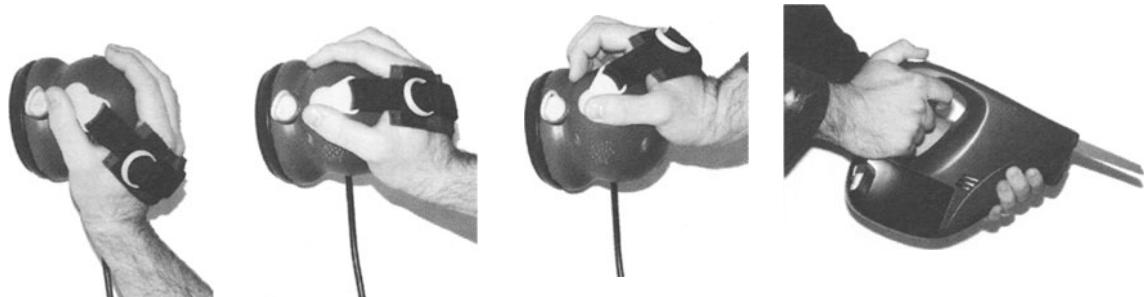
Unfortunately 70% of the UK adult population does not get enough exercise.

After completing her MA in Communication Art and Design at the RCA, Ellie worked closely with Walsall Walk On in the West Midlands, a local walking group, and with Keighley Women's Group in West Yorkshire. Outcomes from the study, which looked at user responses to messages about health and well-being, included a set of 'What are you waiting for?' posters to be placed at bus stops, in doctor's surgeries and by lifts as triggers in the environment to encourage people to walk. Zoned bullseye maps measuring distance as walking time as opposed to miles were also proposed, together with a generic poster campaign to promote greater use of urban green spaces and poster shells to provide local walking groups with a design kit to produce their own communication.

### **Stepping stone – designing an inclusive pedometer**

The research partner was the British Heart Foundation, which was also interested in the development of a cheap and easy to use pedometer to give people positive feedback on their progress. Barry Menmuir, after completing his MA in Industrial Design Engineering at the RCA worked on this aspect of the collaboration. The result was 'stepping stone' an inclusive pedometer. Use of a pedometer supports regular walking by tracking progress and encouraging the setting of new goals. But most step counters on the market are sports 'gizmos' that are difficult to use and have an image that excludes those most at risk from heart disease, such as older people and low income groups. As an alternative, Barry set out to develop a more inclusive, low-cost pedometer for distribution to Walking The Way To Health participants.

The new step counter needed to be production-ready to meet the deadlines of the national campaign and to cost around £5 to be affordable for target users, and attractive to both young and old. The design process was in three stages: an assessment of existing devices with the help of user groups to identify problems; quantitative research among walkers to determine what features were required; and iterative design development informed throughout by user feedback. The resulting design has one main function button and a clearer display to make it easier to use. Its differentiating aesthetic draws on the



customisable features of mobile phones, using an over-sleeve to cover extraneous buttons whilst enabling brand customisation.

Sandbug and reciprocating saw proposals, Matthew White 2001.

### **Power to the people – tools made easier for all**

DIY (Do-It-Yourself), or home improvement is a very popular activity, especially among those of retirement age with more time on their hands. But power tools, essential to many basic home improvement tasks, are almost always designed without taking into account the physical impairments that result from ageing. Previous research at the HHRC had identified a significant market opportunity in developing tools and other products that could extend people's ability to undertake DIY projects in later life, and especially for single older women. After completing his MA in Industrial Design Engineering at the RCA, Matthew White set out with research partner B&Q, UK's leading DIY retailer, to undertake an audit of the current range of B&Q power tools against criteria developed from a review of ergonomic studies and user tests.

This audit was documented as a quick reference guide for B&Q power tool buyers and own brand manufacturers. The audit was followed with a design study to research the needs of older users and those with reduced grip. Together with findings from long-term user tests the results were to generate several product concepts. Four were selected in conjunction with B&Q for development: a compact cordless screwdriver; a hand strap palm sander; an ergonomic reciprocating/jig saw; and a weight-saving extension clip for a cordless drill. Each concept addressed key ease-of-use factors for each product, such as size, weight, configuration and semiotics. Simple prototypes were made for user testing. After that, full tests were initiated with a view to eventual manufacture and sale in B&Q stores.



Real-time travel, Nick Rawcliffe 2001.

### Real-time travel – navigating intelligent environments

In partnership with high-tech Japanese manufacturer Omron, designer Nick Rawcliffe undertook a study of the potential for remote sensor technologies to enhance the personal mobility of people of all ages and abilities in city centres. Every journey on public transport is unique. Each individual making the journey has specific needs. Not everyone has the same physical abilities. Yet the journey information currently available on public transport systems in cities is uncustomised, indiscriminate and often unreliable. This project set out to investigate the use of 'intelligent' systems to provide accurate, real-time information tailored and delivered to the individual traveller in order to improve personal mobility when travelling in city centres.

User studies were carried out on transport networks in London and Tokyo with observations of a mix of locals and tourists, older and disabled people, children and commuters providing insights into journey behaviour. Omron sensor technologies capable of being embedded into the built environment (gates, bus stops, barriers etc) and vehicles (buses, trains, trams etc) were assessed. As a result, two 'business model' scenarios are proposed for 2005. These describe Omron as running a master system which 'closes the loop' of the journey-making process, integrating transport terminals, networks, users and destinations. Real-Time Travel, a mobility system for London, does this with the use of an ID Peg which fits on your keyring; a Happy Travel system for Tokyo uses your mobile phone to interact with the intelligent environment.



Home industry, Yuko Tsurumaru 2000.

### Home industry – new tools for homeworkers

Pieceworkers who work by hand with industrial processes in the home are among the most socially vulnerable and economically exploited groups of workers in the UK. A high proportion of those carrying out manual jobs such as sewing, machining, packing and assembly at home, are female and from ethnic minorities. Their work is often repetitive, dirty and hazardous; they lack adequate space and facilities; and they cannot afford to purchase suitable furniture and equipment to support their work. This R&D project by designer Yuko Tsurumaru, involved observation of six homeworking households in South Wales, Gosport and West Yorkshire in order to develop a range of low-tech products that could either be purchased at low cost by the homeworker

or supplied free of charge by the employer. Study of homeworkers led to the generation of a series of design proposals targeted at specific user contexts: seating, lighting, trays, bags.

Three in particular have been realised: a kitchen workstool in solid beech designed for perching at the kitchen sink to stick and assemble textile samples; a group of table-top organisers in vacuum-formed plastic to assist in small-scale electronic component assembly; and, third, a series of stiff paper bags in bright colours to hold and transport rubber trimmings while blending with a domestic interior. Prototypes were tested with users and amendments incorporated as part of an iterative development process. The project demonstrates how simple, inexpensive design can contribute to quality of life for those working with industrial processes and materials in their kitchens, halls and living rooms.

## Summary

The work of the Research Associates programme has helped to bring the idea of inclusive design into greater focus. In 1999, when the programme started, the concept was still bound up in many people's minds with attempts to make design for disability less of a minority activity. But attitudes have changed rapidly. Today, there is growing recognition that inclusive design is not just socially and politically desirable but also makes real business sense in terms of opening up broader markets. Inclusive design transfers responsibility from the user of design to the design process itself. If designers (and the companies who commission them) do not accept responsibility for what happens when people try to use their designs, then the net outcome is design exclusion. In attempting to address design exclusion, the Research Associate Programme and its partners have sought to marry technological drivers (which shape new ways of living and working) with more traditional demographic ones (which predict such trends as population ageing).

At a practical level, a significant number of these projects are going forward to production or realisation in some other form. For example, Ellie Risdale's poster campaign has been rolled out in print around the UK, and can be seen in your local surgery, library and council offices. Barry Menmuir's pedometer is scheduled for production in 2003, and two of Matthew White's power tools, were launched by B&Q in time



Into production: Matthew White's Gofer and Sandbug, launched October 2002.

for Christmas 2002, with others following in the spring of 2003. Lotta Vanaanen's Carousel has been exhibited under the auspices of British Telecom (BT).

Currently the Helen Hamlyn Research Centre is looking at ways to transfer this process and experience to professional design companies, and some of this work is covered in the next chapter – A designer-centred approach. Case studies based on the Research Associate programmeme have also provided the core content for a web-based educational tool commissioned by the UK Design Council. This gives guidance for students and tutors on inclusive design practice, and offers project briefs and support material for design students of at all levels of education. The tool can be accessed as [www.designcouncil.org.info/inclusive-design](http://www.designcouncil.org.info/inclusive-design)

## Acknowledgements

Neither the Design for Our Future Selves competition, nor the Research Associates programmeme would have been a success without the support and commitment of the professors and studio staff of the Royal College of Art, and the enthusiasm of all the many students who have participated so actively in the various programmes described in this chapter.

The authors would also like to thank the companies and charities that have worked in partnership with the Helen Hamlyn Research Centre on the Research Associate Programme, and also the judges and sponsors of the Designing for Our Future Selves Competition over the past eight years.

Particular thanks go to design for our future selves competitors: Esther Perea-Borobia, Industrial Design Engineering 1995; Sabine Frank, Industrial Design Engineering 1996; Gavin Pryke, Ceramics and Glass 1994; Stephanie Kubanek, Industrial Design Engineering 1996; Jim Das, Vehicle Design 1996; Charles Cooke, Industrial Design Engineering 1998; Martin Bloomfield, RCA Industrial Design Engineering 1999; Hugo Glover, Design Products 2002; Ben Wilson, Design Products 2001; William Welch, Goldsmithing, Silversmithing, Metalwork and Jewellery 2001;

Helen Hamlyn Research Associates and partners: Lotta Vaananen with Leonard Cheshire, Ellie Ridsdale with the British Heart Foundation, Barry Menmuir with the British Heart Foundation, Matthew White with B&Q, Nick Rawcliffe with Omron, Yuko Tsurumaru with Geoffrey Reid Associates and the Design Council.

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Chapter title page image: 'Pull the Plug' photographer Ivan Coleman, who took most of the other competition entry photographs. Also Reader Communications for Good Grips and B&Q for the Sandbug and Gofer.

Details on past projects and awards under the above programmes can be found on the Helen Hamlyn Research Centre website at [www.hhrc.rca.ac.uk](http://www.hhrc.rca.ac.uk)

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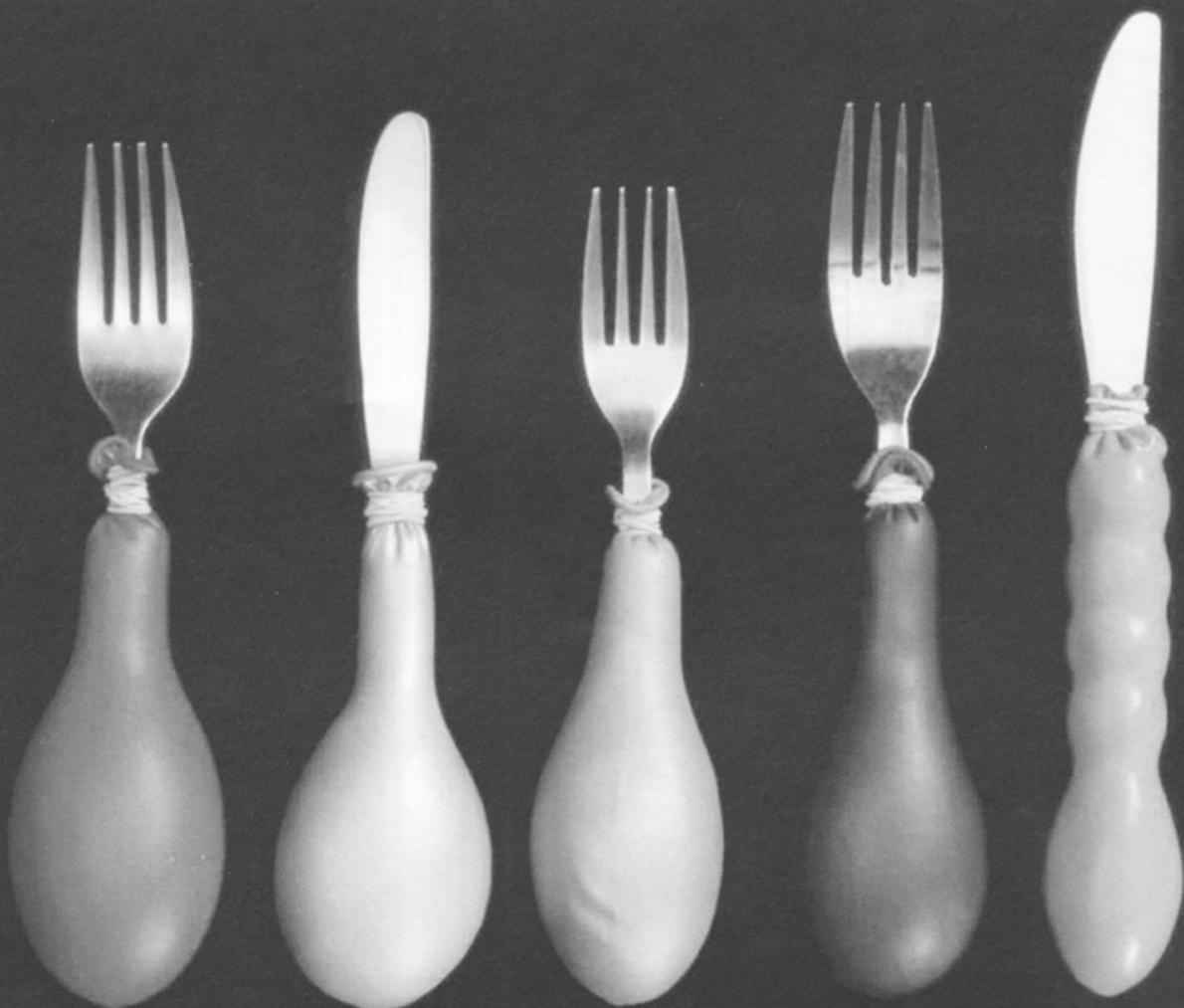
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## Chapter 29

# A designer-centred approach

**Cherie Lebon and Roger Coleman**  
Royal College of Art



The introduction to this book pointed out how the design industry has responded to the new priorities of ageing populations and the demands of disabled people for full access and participation. A range of approaches and strategies has been developed, along with design methods that engage with the needs of a wide range of users. Increasingly practitioners now regard inclusive design as part of good design practice. They want to deliver inclusively designed products, but currently lack access to information and tools that fit the ways they work. Inclusivity is often sidelined by time and budget constraints, and a failure on the part of the client to ask for designs that target a wider sector of the population through inclusive features. This presents designers with the further challenge, and requires that they have a command of the facts and arguments that can convince sceptical clients.

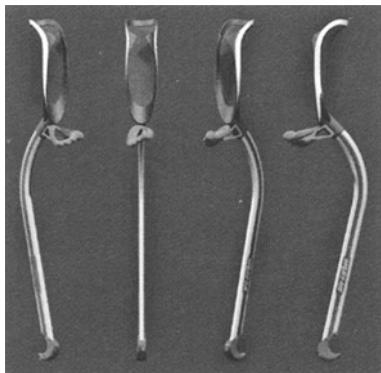
Through ten years of experience of working on user-centred design projects and programmes with three design communities – students, recent graduates, and professionals in industry, consultancies, and private practice – the Helen Hamlyn Centre at the Royal College of Art (HHRC) has gained an insight into their information needs. This chapter attempts to draw together lessons learned from that work, and from collaborations with users, industry, education and the voluntary sector.

## Inclusive design champions

A key lesson that has emerged from this experience is the importance of champions in all sectors, from design, through industry to education. Other chapters in this book have stressed the power of recent and upcoming legislation and EU directives, and how this will oblige companies to reassess the way they treat their customers. Businesses now have to embrace the concept of making premises, products and services accessible to older and disabled people, and adopt employment policies that do not discriminate against such people. Adjusting to these new realities requires significant cultural change within organisations, and the leadership to see them through. Hence the need for champions who can recognise the challenges and opportunities and act as the focus for change. Consequently, to be effective, information, guidance and other resources must be organised in ways that support champions working at all levels within the design professions, from design management to design education.



Tableware by Lisa-Dionne Morris, RCA Design Products 2000.



Pro-crutches, Guy Robinson, RCA Industrial Design Engineering 2001.

Delivering on this is difficult. Much information that could help designers is available already; there are many publications and websites that contain specific information about disabilities and impairments or illustrate demographic drivers for inclusive design. However, much of this is in formats designers find unapproachable due to medical language and technical language. Designers do not like to read dense texts, they prefer their information intake to be rapid and visual (McDonald and Lebon, 2001), and this presents a challenge in terms of editing and re-presenting academic and specialist material.

### Working with young designers

The initial engagement with the issue of building up a body of information and design exemplars came through the DesignAge programme at the Royal College of Art, which was introduced in the opening chapter, along with its core message of design for our future selves. The emphasis on the future rather than the present was important in the context of the RCA as the College is the leading pre-professional institution in design education, and its graduates will play an important role in shaping the future through the products and services they design – from furniture, fashion and textiles, to automobiles and public transport vehicles, and on to interface and computer-related design. RCA graduates reach a very high standard during their two-year practice based MA courses, and the level of hiring by industry is well over 90% in the design disciplines, and in some cases almost 100%. In addition, major companies and many professional designers look to the RCA for pointers towards the future of design in all these fields.

In the case of population ageing, it was also possible to predict the future with a high degree of accuracy, but that required gathering information on demographics, as well as on other aspects of ageing. What became rapidly apparent was that the majority of the literature was from academic disciplines, such as gerontology, healthcare and social sciences, and as such was not ideally suited to young designers working in a high-pressure environment. Much of the material stressed the depressing picture of deficit and decline, that is the outcome of the medical model of ageing and disability (see chapter 3, *Lifestyle, design and disability*) and a welfare system predicated on dependency. Marketing material, on the other hand, often painted a stereotypical

and highly conservative picture of the older consumer. Although much material was gathered together under the DesignAge programme – in particular more ephemeral items such as press articles and market research reports – it was clear that alternative ways had to be found of acquiring design-relevant information.

This prompted a series of initiatives which a significant number of publications and exhibitions. First, a group of 18 leading figures in the UK design world was interviewed to determine the level of awareness within the upper levels of the profession (Coleman and Bound, 93). Apart from providing a benchmark for the current state of thinking at the beginning of the programme, this also stimulated interest and established the core of a network of supporters and contributors. This made a guest lecture series possible, which in turn stimulated student interest, in particular when they heard people they admired exploring ageing in imaginative and thoughtful ways.

Lectures by key design figures were interspersed with others from experts in other disciplines, from marketing to social sciences, and including older people themselves. In each case the lecturer was asked to tease out the design implications of population ageing from their own point of view or discipline. The lectures were transcribed and became part of a growing collection of information. But the important point about them was that they were the beginnings of a designerly perspective on the subject. Student response was excellent, and the value of this combination of experts from different disciplines prompted a one-day conference at the RCA organised jointly with the Ergonomics Society. Speakers included leading international designers, Maria Benktzon of Ergonomi Design Gruppen, and Bill Moggeridge, founder of IDEO, ergonomists, design commentators and researchers on, for example, the growth of older drivers and the implications for vehicle design.

This event also provided a wealth of design-relevant information, this time in a more concentrated format, and resulted in the special edition of Applied Ergonomics (Vol 21, February 93) which proved a landmark publication in the subject area. The conference attracted a mix of designers, researchers and industry delegates, and the interest aroused triggered a series of subject-specific seminars at the RCA: on vehicle, fashion and textiles, furniture and retail design. In each case a mix of leading designers, experts in materials, technology and

**Adjusting to these new realities demands more than minor revisions to business practice, it requires significant cultural change within organisations, and the leadership to see them through**

**design for  
our future  
selves**  
**>competition**  
**2002**  
**the helen  
hamlyn  
research  
centre**



Royal College of Art  
Postgraduate Art & Design

other disciplines – for example an Alexander Technique teacher in the case of furniture design – and older people made presentations and then engaged in practical workshops with RCA students and staff. These triggered student projects and an annual competition, with a first exhibition at the international 3-day conference held at the RCA in 1993, European Year of Older People. Much of the material from these seminars was written up, along with the results of an extended collaboration with Safeway Stores, in a book published to coincide with the conference (Coleman, 93).

All of these events – conferences, seminars, competition and exhibition, were staged under the ‘for our future selves’ theme, and the resulting transcripts and publications, along with the special edition of Applied Ergonomics and the conference book delivered the much needed basic material on the design implications of population ageing. The conference book included an overview of relevant design approaches and methods, and also outlined some of the new research methods and activities emerging from aspects of the DesignAge programme. In particular the results of subject specific workshops were covered, where ‘shopping lists for change’ were mapped out to identify new design opportunities. A practical collaboration with Safeway Stores was also documented, where a range of techniques was used to observe and understand older users, and also to identify potential improvements to store design. As a result of that collaboration, Safeway experimented with some 30 possible age- and ability-friendly design changes and implemented a significant number of these after in-store trials (Coleman, 93: 57-68).

### Resources for design students

In order to support students working on age-related competition briefs a collaboration developed with the University of the Third Age (U3A), described in the previous chapter. This collaboration brought older users into the College for focus groups and other interaction with students through a series of regular ‘user forums’. However, simply meeting and talking to older users was not in itself an adequate way of obtaining the sort of information students required, nor did it challenge students to seek out more structured and soundly based information from U3A members. What was needed was professional input on user research

methods, which was supplied by Oliver Murphy, principal of market research consultancy Diagnostics.

Not only did he give an annual master class for competition entrants, he also supplied extensive notes on his presentation, which were immediately in high demand. To meet this demand, an in-house publication was produced covering a range of techniques, from focus groups, through structured interviews, and on to more creative techniques involving mood boards and other props. More recently, workshops on user research techniques have been given by Colette Nicolle of the HUSAT research centre, Loughborough University, based on the rehabilitation and inclusive design research methodologies she has been involved in developing ([www.stakes.fi/include](http://www.stakes.fi/include)).

## Special collection

As the quantity of information and range of techniques available increased it became necessary to consolidate it in an accessible and catalogued format, and this need led directly to a special collection of age-related material within the RCA library, which has since grown to house around 1,500 items. Initially this was intended for the sole use of RCA students, but as interest in the subject grew, so did the number of inquiries from students at other institutions and from professional designers and researchers. Luckily, a catalogue had been started, based on a bibliographic record used for previous research. This included keywords, an abstract of the item using an extended set of defined terms, and details on the nature of the material – press cutting, journal article, video or sound tape, and so on, all of which made it readily searchable in database format. Eventually a website was established so that people from around the world could access the database and either track down relevant material locally or arrange to visit the RCA library.

## Website

The website made it possible to add further resources and information about the programme, and serve this selectively both to the outside world, and internally to RCA students. This offered the possibility of carrying a further database of active researchers, designers and other key contacts in Europe (see chapter 17, A European perspective) and also of capturing key information from students entering the competition. By asking a structured set of questions about the



Helen Hamlyn presenting an award certificate to Alberto Martinez of RCA Design Products 2000.

background to their entry, the market need, key age-friendly points, research undertaken, and so on, and later adding images of the final design both on its own and in use, it became possible to build a database of project work, which provided the exemplars needed to make the case for such new approaches to design.

### **Student handbook**

As the competition became an established part of the College calendar so the need to bring students up to speed with the process and background to the subject became ever more pressing. The response to this was to produce a simple handbook of information and guidance, which has since grown into a more substantial publication, introducing the competition briefs, giving examples of how to approach them, offering guidance on user research methods, and listing key information sources, in particular those accessible via the Internet. Over the years, the handbook has evolved into something that very closely matches student need and ensures a high quality of submissions.

**Realising that older people are not a separate species but simply 'ourselves further along the life-course', reinforced the 'design for our future selves' message**

### **User forums**

The first point of contact for students is personal, through presentations given in the studios by the competition coordinator, who also supports them through the process. The handbook offers valuable guidance and helps to focus background research effectively, but the key element is working with users, and this was made possible through an extensive network of organisations and individuals. Brief-specific user forums are organised, and special user groups are established for individual projects. This is managed by members of staff as relationships with users can be sensitive and it is important to select the right groups. These are often chosen to challenge the designer and stretch their thinking, which has led to the concept of 'critical users' which has proved helpful for both users and designers in seeing the benefit of working with users who would, under normal conditions, be ignored in the design process (Cassim, 2002; Gheerawo and Lebon 2002).

### **Methods Lab**

Participation in the European Network that was triggered by the 1993 conference made it possible to secure EU funding for an international research programme, PRESENCE, on New Media for Older People

(Hofmmeister and de Charon de Saint Germain, 1999), that brought together designers, educators and researchers from Norway, Italy, The Netherlands and the UK. The UK partner was the Royal College of Art, with both DesignAge (later the HHRC) and the Computer-Related Design department participating. The PRESENCE programme was built around developing innovative proposals for age-friendly applications of information technology and media. User research in specific local communities in Italy, Norway and The Netherlands was at the heart of the project, and this created an opportunity to investigate a whole range of user research methodologies. This was done through a seminar at the beginning of the programme, bringing together specialists in user research from a range of disciplines and from a number of design companies.

Further smaller events took place throughout the project, and a publication, *The Methods Lab* (Coleman, Bound and Aldersey-Williams, 1999), was produced for the closing conference. The intention was to provide information on a range of user research methods in a designer-friendly format, and considerable effort was put into establishing what that should be. The final result is based on work initially carried out at IDEO and extended to include additional methodologies collected and developed under the PRESENCE project. Some of these methodologies have since proved to be influential, and demonstrated the possibility of transferring research methods from other disciplines to the design field, and vice versa (Kember, 2002).

## **Working with professional designers**

The Methods Lab was the first attempt by the HHRC to develop resources for professional designers and researchers, as opposed to sharing what had been developed to support students at the RCA. The questions it raised in subsequent discussions with design professionals, and the growing interest in more inclusive approaches to design, flagged up the need for a more systematic provision of information and guidance for the design profession.

A meeting of the design managers at the Design Council in London identified the lack of such information and guidance as a key restraint on the uptake of inclusive design and spelled out the need for information within three communities: decision makers in industry and retailing; design managers in major companies and on large scale

projects; and practicing designers in large and small companies, and in consultancies. This need was re-examined at a further meeting at the Design Council organised by the Engineering and Physical Sciences Research Council to launch a call under its EQUAL (Extend Quality Life) programme, and led directly to the funding of the i~design research project, of which the Design Council is a key partner.

This gave the HHRC an opportunity to build on its past and ongoing work with design students and recent graduates and look more closely at the needs of the design community. Initially the focus was on extending the Methods Lab into a more substantial resource. However, the research process – which included desk research, interviews and workshops with designers, observations of design consultancies working to an inclusive design brief under the DBA challenge, and of recent RCA graduates working with industry on inclusive design projects – began to indicate that what was required was a more extensive designer-friendly resource.

The HHRC has identified five major tasks in advancing the practice of inclusive design. Some of these are more relevant to decision makers, some to design managers and some to practising professionals.

- To develop a language in which to talk about inclusivity – a series of ideas and expressions that can successfully communicate core messages.
- To construct arguments in support of those messages, by assembling relevant facts and figures in ways that present a convincing case to key audiences.
- To provide the exemplars and case studies of good practice that can put flesh on the arguments.
- To develop business and design management models that put inclusivity at the heart of good practice through a process that involves understanding, auditing and benchmarking as a basis for immediate improvement and future evaluation, and fosters innovation.
- To provide methods that can help designers obtain useful information from and about users within the timeframe of often short projects.

Methods must support designers in the context of their daily work. Where the project is larger in scale, or resources allow, professional

researchers may well be brought in, and so an understanding of what and how they can contribute is important, although the larger consultancies are developing their own in-house resources (Coleman and Cassim, 2001; Coleman and Gheerawo, 2002, Coleman and Myerson, 2002).

Without convincing language, information and practical exemplars it is not easy for people to understand the potential that design holds for delivering an inclusive social and physical environment, nor is it easy for professionals to adopt appropriate methods and attitudes. Exemplars and case studies have to demonstrate potential benefits, not just to end users, but to industry, commerce and importantly to shareholders through increased profitability and reputation. They must also demonstrate benefits to design professionals through more convincing proposals to potential clients and enhanced professional competence, and to design students by establishing new skill areas that increase their employment opportunities.

Supporting potential champions requires equipping them with material that can help answer the questions of their colleagues and giving them rapid access to more in-depth information (Coleman 2001, 47), all in a designer-friendly format (Lebbon and Morrow, 2002). Early feedback from the design community is that the material should have a physical interface, even if the bulk of it is available via the Internet.

Where this all becomes interesting is in the cross-over between disciplines and the blurring of boundaries that is characteristic of modern practice in larger design groups. In particular where cheap video recorders and editing software can be combined with more traditional brainstorming and group working techniques in ways that are almost unique to individual design groups. This suggests that any information resource must present material in formats that can be integrated into rapidly evolving working methods.

**Supporting potential champions requires equipping them with material that can help answer the questions of their colleagues**

## Background research

The Methods Lab provided a good starting point for the i~design research. These methods had been collated and reviewed by a team of experts from design and research backgrounds and mapped against two axes based on the sort of information they were likely to deliver: from designer-centred to user-centred, and from visual to functional

qualities. Levels of resources required were described in terms of expertise, time, staff commitment and cost, and references were given to further reading. Each entry was supported by a description of the method and its use written by an acknowledged expert.

This document provided a frame of reference for a broad literature review covering design and engineering methods and processes, methods and tools from ergonomics and human factors. Design areas covered included design in the built environment, transport systems design, user centred design and human computer interface design. The development of key ideas over time and the actions and events that stimulated them were also explored and this work formed the basis of the opening chapter – From margins to mainstream. The Methods Lab also provided a basis for an investigation of attitudes within the design profession that could be compared with the results of earlier interviews with designers.

### DBA questionnaire

The collaboration between the HHRC and the Design Business Association (covered at length in chapter 31, Critical users in design innovation), offered an opportunity to survey the level of interest and awareness among professional designers. A questionnaire was structured to give an insight into the level of knowledge and engagement with inclusive design practice, and also into whether or not companies thought it was important to them and relevant to their client base.

The level of response was good, but there were some surprises, in particular in terms of how few respondents from the communications industries felt that inclusive design was relevant to them, despite the implications of the Disability Discrimination Act, and how little progress had been made since the 1991 interviews with designers. Although in that case the designers questioned had been much more senior and therefore should have been more interested in trends like population ageing. The bonus was that many of the product design consultancies were interested in knowing more and were prepared to help with the research project, and that younger designers showed a genuine interest. Importantly, the questionnaire gave a useful indication of the types of information required and the formats preferred. It also gave access to a pool of interested practitioners who were willing to

engage with inclusive design provided they could access suitable and supportive information and tools.

### Expert interviews

Drawing on the pool of questionnaire respondents, participants in the DBA Challenge and experts who had previously contributed to the Methods Lab, a series of expert interviews was then set up. This was followed by a further set of interviews with people recommended by the initial interviewees.

Each person was interviewed for about an hour, having previously received a short list of questions and a list of methods that were believed by the research team to be relevant to the area of expertise of the interviewee. Each person was asked about methods, tools and information key to their area of expertise, and was also asked whether or not they were familiar with the listed methods, and if any methods they considered important had been omitted. This gave considerable insight into how designers work, and importantly revealed the considerable differences in working practices between design consultancies. In essence, each consultancy had its own very personal approaches that constituted a unique culture within the organisation.

A further important discovery was the extent of the transfer and adaptation of methods from other disciplines, in particular social sciences and ergonomics, both for user research purposes, and as part of the idea generation process. Ethnographic methods are especially appealing to designers as they provide visual and experiential information, giving 'real world and real time' insight into the ways people live their lives, how they interact with objects, people and space and what they are trying to achieve. These snap-shots of real life can then be interpreted, shown to clients to support design concept decisions and used as a way of communicating with other members of the design project team (see chapter 24, Observation for innovation).

Ethnographic methods are especially appealing to designers as they provide visual and experiential information, giving 'real world and real time' insight into the ways people live

### Workshops

The interview and questionnaire process had helped to establish what information was thought to be useful for designers and researchers who wanted to practice inclusive design. The rough mapping process that had been used had been challenged by some of the interviewees

**To work inclusively, designers need access to users, and relevant best practice case studies**

and this prompted a reclassification of the materials into what appeared to be more appropriate groupings.

In order to test this and to find out how designers and researchers would wish this type of information to be presented to them a small workshop was held, drawing from the same pool of design professionals, but with the addition of some graduate designers from the RCA who were working with companies on inclusive design projects. The workshop divided the participants up into teams, each of which was given a brief to research and asked to make a case for taking an inclusive design approach. Each team was given exactly the same material to work from, a large coloured 'toolbox' full of material gathered throughout the literature search, most of it in its original form. CD-ROMs targeted at designers were included, as were materials developed by the research team and other material that had been edited and repackaged in a more designer-friendly format, along with a list of relevant websites.

Each team was asked to then rate the usefulness and usability of the contents of the 'toolbox' and decide whether the information was something they would wish to have in their personal possession, whether it should be available to the studio/office or whether it was something that may prove useful, but should be located externally, on the web, in a library or elsewhere.

At the end of the workshop the participants were given an overview of the broad design concept for the eventual toolkit in order to test assumptions against the experience of the participants.

### **What did we learn?**

Designers have to work very quickly; deadlines are short, limiting the time available for research and often it is difficult to persuade a client of the benefit of paying for research with users before there is a prototype. Tight briefs set by clients allow little opportunity to adopt an inclusive approach unless a convincing case can be made for business advantage. Consequently, any research process must be supported by rapidly accessible tools and clear, precise information that enables designers to quickly get to the knowledge, and key facts and figures that will support design decisions and proposals to clients.

To work inclusively designers need access to users, and relevant best practice case studies, both of which are difficult for them to achieve

due to time and cost constraints. Even access to one or two users can make a significant difference, but as projects vary considerably only the largest consultancies are in a position to actively involve users. They also need to be informed about user research methods, especially quick and dirty ones that can be used in the very early stages of concept generation, and that may not involve users directly, that may draw on a body of accumulated information within the office, or may tap into immediate contacts, friends and relations. Many designers like to develop their own methods as part of a unique way of working, but they also like to know what others are doing and have a spread of ideas on which to build.

Designers want to know what the top consultancies are doing. How to convince clients that a more inclusive approach is good for business, how to access appropriate research findings and incorporate them into their work and proposals, how to inspire and encourage bright junior designers to think about people who are not like themselves. How to build up a useful collection of resources – user-information, methodologies, websites, books, tools etc. – within their own offices, and how things like the methods lab came about, as can be seen from chapter 15 'Everyday inclusive design' contributed by Nina Warburton of Alloy Design.

In other words, they are most interested in finding ways to integrate an inclusive approach into their everyday practice, that will help them design better products and help their clients make more money. They want to know what current best practice and thinking is and stay abreast of new developments, and they want to know more about the what, how and why of inclusive design. The problem is they have very little time in which to do this, and no way of sifting out the nuggets of valuable information and guidance from a great mass of material. Someone has to do that for them, but they do not want the resulting information delivered in a prescriptive form. They want to develop their own ways of working and be able to incorporate information and methods into that, not be told how to go about designing.

## A resource for the design community

Our conclusion was that what is needed is a 'design toolkit': a package of facts, figures and other information, along with stimulus material including images of users and other aids to visualising user interactions

with products and services. The information needs to be granular and come in bite-sized chunks, be easy to organise and reorganise for different projects, and also support individual champions within consultancies by providing key arguments and an overview of the subject. The resource should include links to academics and other experts, and to specialist professionals in user research, evaluation, and related fields, case studies of best practice and profiles of leading designers and consultancies. It should also contain web links to sources of information, user communities, recent and upcoming legislation and other useful material.

### DBA Challenge toolkits

Some initial progress has been made in this direction in the context of the DBA Inclusive Design Challenge (Cassim, 2001). Most of the consultancies involved have little previous experience of inclusive design, and take up the challenge as a way of improving their skills base and keeping up to date. Given the short time frame of six to eight weeks it is imperative to get the designers up to speed as quickly as possible. For this reason, a user group is chosen for each project to push design thinking – visually impaired users for a website design, physically impaired users for a customisable driver interface, and people with arthritis for a packaging project. The consultancies are also given ‘toolkits’ consisting of a conceptual framework for inclusive design, demographic, legislative and other data, case studies, user-research methodologies, appropriate website links and contacts with potential manufacturers, and more. In other words they are given a sub-set of the contents of the ultimate ‘design toolkit’, and their reactions prove valuable in determining what the final form and contents of the toolkit should be.

### A tool kit for designing inclusively

Based on our research, we are currently preparing an interactive database from which useful material and references can be selected and organised on a job-by-job basis. Key to this is a simple interface that allows information to be sorted and selected, and standard output formats with abundant illustrations that can be printed off and used directly as part of presentations to clients and as reference and stimulus material within the design office. The toolkit is not intended to be

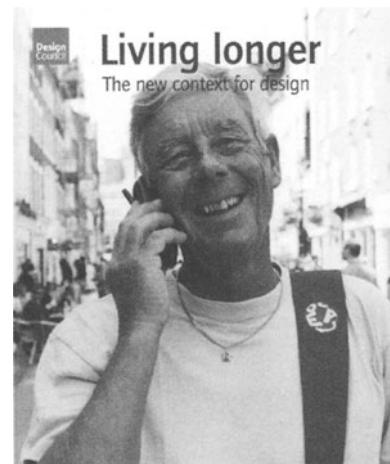
exhaustive – although the design allows for simple updating – but meant to form the basis of expanding collections held in design offices that are tailored to the particular specialisms and working methods of individual consultancies and designers.

This tool will be aimed at design practitioners in the first instance. The intention is that it will support an inclusive design champion within a commercial organisation, a design consultancy or project team. It will provide access to information that is directly relevant and will introduce newcomers to an overview of the reasons that inclusive design has become an important aspect of design performance and innovation development. The toolkit will enable its user to create personal and project files, collate resources and arrange them in a way that supports their own work, thereby making it a very personal tool. The resource will contain methods, case studies, a collection of images of users, links to agencies, companies, charities and other organisations. It will contain a listing of user research methods classified by activity type – are they carried out by a group of designers in a studio situation, do they require direct contact with users, is the method based on observation etc. Case studies will reflect benefits to clients and be grouped by subject area such as transport design, product design or communication design. These will be supported by electronic versions of detailed published documents where they are available. There will also be web links to relevant national and international organisations.

## Where next?

It is hoped that the toolkit will make a significant contribution to the progress towards inclusive design, but it is only part of the bigger picture. What the research revealed was the need to address several communities, all of which have an important part to play in delivering inclusivity on any significant scale (Lebbon and Morrow, 2002). These include, among others, decision makers in industry, design educators, and professional associations of designers. A range of initiatives has been launched by the i~design partners in order to achieve this, especially through the UK Design Council, which has played a leading role in promoting the concept and practice of inclusive design.

These initiatives have included a Design Council Policy Paper 'Living Longer: the new context for design' which makes recommendations to government, industry, education and the design profession (Coleman,



Design Council publications: In print, Living Longer, the new context for design, via internet, an inclusive design education resource.

2001). A number of these recommendations have already been taken up, importantly, by the British Standards Institution in the form of a new BS in the 7000 series, which is currently being drafted by a panel including three i~design partners, one of which is the Design Council. The Design Council has also incorporated a section on inclusive design in its new, web-based information resource, and is likely to be the host of the toolkit in its final form. It has also developed with the assistance of the HHRC, a web-based educational resource on inclusive design that offers project briefs and supportive information for design tutors at all levels of education.

Still in the field of education, the Royal Society for the Encouragement of Arts Manufacture and Commerce (RSA) is expanding the New Design for Old section of its Student Design Awards as part of a refocusing of the scheme around 21<sup>st</sup> century priorities like sustainability and inclusivity. The section will be entitled 'Inclusive Worlds' and participating colleges will be encouraged to take advantage of the web-based resources that are becoming available on the subject.

At the professional practice level, a workshop held as part of the INCLUDE 2001 conference at the RCA identified inclusive design as an important element of future Continuing Professional Development (CPD) programmes, and it is hope that this will be taken up by the leading professional bodies in the UK and internationally.

## Acknowledgements

In particular, the authors wish to thank the EPSRC for its support of much of the above work, as part of the i~design research programme. They would also like to thank the Design Business Association and its members who have worked with the Helen Hamlyn Research Centre on this investigation, as well as the many other designers who have given freely of their time in order to contribute to this work.

Chapter title page image: Adaptable cutlery by William Welch, RCA Goldsmithing, Silversmithing, Metalwork and Jewellery. The Design Council educational resource can be found at [www.designcouncil.info/inclusive-design](http://www.designcouncil.info/inclusive-design)

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## Chapter 30

# What is an inclusive design process?

**Martin Bontoft and Graham Pullin**  
IDEO London



Our argument is that inclusive design is not simply about access to guidelines and information about people with functional loss. We are all, at various times, rendered disabled by the world we inhabit and that we designed. The problem is much broader and more diverse, and the process that deals with design inclusion has to be the same process that deals with mainstream products and services. It needs to be open to, and encouraging of, input that challenges and is uncomfortable. The design process needs to accept and effectively deal with complexity, accommodate lots of different and conflicting points of view. Moreover, simply knowing about the issues is useful, but pointless if you do nothing about them. We describe how engaging emotionally with the issues leads to a greater acceptance of the need for inclusivity, whilst at the same time improving the design.

Despite the apparent need, the years of effort, the special interest and lobby groups, the conferences and the resources available to designers, truly inclusive products and services remain the exception, not the norm. In our two chapters, Graham Pullin and I explore two aspects of this phenomenon. First – recognising the fact that there IS still a difference between an ‘inclusive’ and a ‘mainstream’ design project – what is it that mediates whether inclusivity is in the brief we get from our clients? (see chapter 12 ‘Connecting business, inclusion and design’) Second, here, we discuss how designers can move away from a specious discussion of inclusivity, to ask: what is it that could make a design process inherently inclusive?

In this chapter we describe some elements of the design process that IDEO chooses to follow and we try to highlight how this process promotes the needs of a diverse set of users and how, in this way, it is inclusive.

The techniques we use, and the organisational culture that provide the context for their use, have not arrived by chance. We believe that the most important determinants are:

- that, as designers, we have access to, and need to process, increasingly large amounts of data,
- we work in high-technologies, with ‘new to the world’ products,
- the acknowledgement that we are all challenged by the world we live in,
- recognition of the immense diversity that exists within our design populations.

## White noise

Today's designers have access to, and need to process, increasingly large amounts of data. On every project we are faced with a bewildering array of information and options...

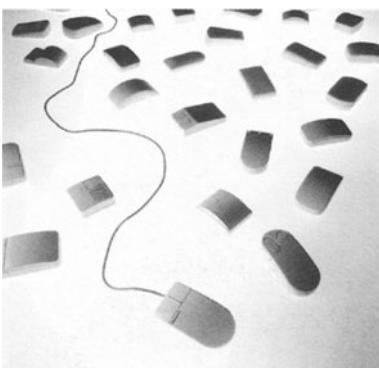
- materials, technologies and processes – foamed aluminium, textile that senses the pressure of your touch, metals that have memory
- software, interactions and behaviours – phones that accept voice commands, cameras that recognise gestures, software that can recognise and identify tunes in seconds
- information about users that ranges from the cultural and demographic to the behavioural and emotional, through to the cellular and neurological
- and crossovers between domains, so that we now have remote health diagnostics via TV, radio via your computer and warehouse technology enhancing the PRADA brand.

If this information complexity were not enough, we also find that the managerial complexity of our projects is increasing. Our recent work for PRADA's New York Epicenter store involved working with over 20 other subcontractors, occasionally acting as the glue that held them together. Even if we wanted to, we could not reduce the complexity in our projects; this is an inescapable dynamic. Instead we've tried to develop ways of working that accommodate and encourage large, diverse and unaligned flows of information.

## The consequence of technology

IDEO is a large design and innovation consultancy with its roots in product design. Headquartered less than a mile from Stanford University in California's Silicon Valley, it has for years helped its clients bring the latest technologies to market in engaging and profitable ways. Many times it has brought to market devices, products and services that have never been seen before.

'Me-too' design, where the client simply wants to play catch-up with the competition, has been almost totally replaced by 'leapfrog' design, and 'innovation' is among the most commonly used words in our client meetings. Consequently, and for a long time now, designers have been unable to research actual use of comparable devices: there are none. The sensitisation to user issues that informs and inspires a design team is hard to find when the team is charged with creating



DEO products, past and present

Top: the Microsoft Mouse, above: Grid laptop.

solutions in a space where no solutions currently exist. We cannot rely on traditional research techniques, (e.g. direct observation, task analysis, focus groups and user forums) because they will tell us plenty about what is, but very little about what might be. Design researchers have had to develop alternative ways of gathering useful data – information that helps direct the design towards relevant ends and, at the same time, which inspires the team.

## We are all challenged

As designers, we live every day with the consequences of our own work. Many of us have come to realise that, depending on the context, we are all frequently challenged and rendered unable to use every day products. For example, the poor usability of the VCR has been raised almost to the level of cliché. (A Google search on 'VCR usability' returns nearly 6,500 pages, the best of which is a parody that substitutes the programming task with an alarm clock: [www.usabilitymustdie.com/usability\\_review.html](http://www.usabilitymustdie.com/usability_review.html))

In a recent study, Jakob Nielsen's researchers watched users make 496 attempts at performing tasks on e-commerce sites. The test spanned 20 sites based in the U.S., focusing on large sites but including a few smaller ones as well. On average, the user success rate was 56%. E-commerce sites lose almost half of their potential sales because users cannot use the site. (Jakob Nielsen, summer 2002, source: [www.useit.com/alertbox/20010819.html](http://www.useit.com/alertbox/20010819.html))

Sometimes this may be due to some assumed deficit in our abilities, other times it is simply contextual. This summer the UK government decided a change to the law was necessary to compel drivers not to use mobile phones while driving, except with a hands free kit. The context of use – already doing a physically and cognitively demanding task – renders us less than ideally able to use a telephone. (Summer, 2002, source: [www.dtr.gov.uk/campaigns/mobile/](http://www.dtr.gov.uk/campaigns/mobile/))

Anyone who has travelled in a city centre bus recently will know just how hard it is to walk through a moving bus with any elegance of motion. Imagine how doubly disadvantaged is the parent of a young child: having to manage the buggy, the shopping, their own safety and the reassurance of the child. Or it may be that disadvantage is cultural in origin. For example, a volunteer group in Leeds set up a swimming club for local Asian women. The organisation found it difficult to find



**IDEO products past and present**

Top: Mallinckrodt Breeze mask  
Centre: Logitech's Pocket Digital camera  
Above: Handspring's Treo.

a swimming pool that could accommodate their needs, as they had to find a pool that was not overlooked by a café or bar and that could provide all female lifeguards. Whilst it is likely that the pools were reasonably accessible to the disabled, nevertheless we still design public buildings that exclude a significant proportion of the public. (Brain J, 2001 Rough Guide to the Community: Get Caught Up in the Hurley Burley, Leeds Student, 11 May 2001 Leeds UK)

This is no small problem: in its latest quarterly Population Trends report the Office of National Statistics estimated the number of people from minority ethnic groups in Britain had hit four million – 7% of the population – for the first time. (Summer 2002 source: [www.statistics.gov.uk/pdfdir/popt0602.pdf](http://www.statistics.gov.uk/pdfdir/popt0602.pdf))

Considered in this way, the conventional definition of disability – functional loss – starts to lose some of its meaning; we tend to replace it (at least in our thinking) with ‘contextual loss’. This captures the fact that bad combinations of context and designed product, service or environment make all functional loss (profound or minor) into a far worse problem than it might be otherwise. Moreover, it indicates that potentially we can disadvantage everyone in this way, no matter whether they have a functional loss or not.

## What this means for us

What we've tried to describe is a situation familiar to many in design: a bewildering array of design information and options, a blurring of conventional definitions of disability, a recognition that our design populations are far more diverse than we ever realised and, still, an absence of knowledge about people's experience of the things we're designing.

This chapter is about IDEO's response to this, which has been essentially to develop and maintain a design process that...

- embraces diversity of input
- emphasises inspiration over validation
- is not aimed at consensus
- prototypes the experience of use.

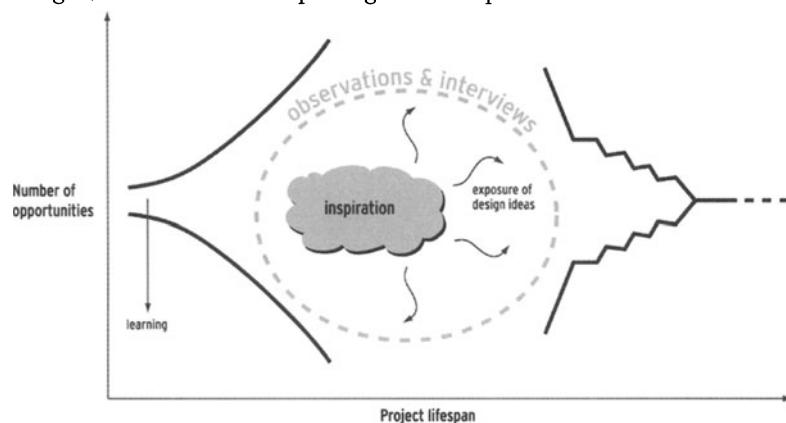
The rest of the chapter explains much of how we do this. The consequence, we will argue, is a design process that is inclusive by its nature.

## How we entertain chaos

There is a diagram we sometimes use to describe in general terms the lifespan of a design project. It describes how projects become increasingly full of chaotic information and opportunities before we focus down onto progressively fewer concepts.

In the early phases of a project we want to do everything possible to increase the opportunities open to us. We call this our divergent phase; during it we're emphasising the need to inspire ourselves to create something that has never before existed, without losing sight of the reality of people's potential experience of use.

It is during this phase that we create the foundations for our designs; hence it is worth placing some emphasis on these activities.



An abstracted view of divergent and convergent phases of a design project.

## Gathering a diversity of input

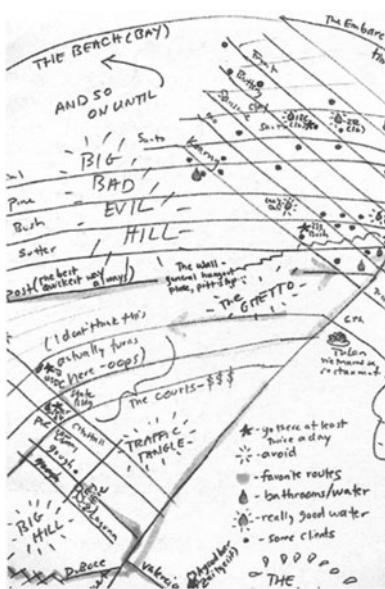
Over the years we have accumulated design research techniques, recently we put them together in a collection we call our Method Cards. There are 51 cards, plus one that explains the context in which they are used. We use them to share process knowledge across the company: each one has brief details of a technique with how and why it might be used. From the project details, it is possible to work out who might have expertise in that technique. But perhaps their major value is in reinforcing the idea that there are many ways to add to the sum of knowledge relevant to each project.

One of these techniques, which we call 'observation', has a worth that transcends the value of the information it generates. In essence, one selects a small number of people then spends time with them, wherever they are, because they are doing something relevant and interesting.



**IDEO Method Cards**

A collection of techniques from many disciplines.



User-created map of water locations in San Francisco.

Frequently the thing we are working on does not yet exist; there are no directly comparable products to view and no users. Although the product may be totally new, it is rare that it will require people to carry out a totally new activity, usually it is possible to find a group that are carrying out a similar activity or satisfying the same need but in a different way. Whilst working on a medical device that required a needle to sit just below the skin, we observed people with insulin pumps (the most similar existing device) and we interviewed staff at a piercing studio (who, it turned out, knew much more about the skin's tolerance of implanted metal than the medical profession).

We may select individuals who have chosen not to do the activity of interest – to see why not – and by the same token we might talk to people who cannot do this activity – to see what is missing for them, or how they may have chosen to fill this gap, or simply because their response may surprise and challenge us. So when we were exploring the needs of people navigating their computers by voice control, we asked blind people how they navigated the world.

The conversations we have with people during observations are always in locations that mean something to them and the experience being researched. Being situated in the actual context of use allows people to respond ‘in real time’, not with a half-remembered view but with thoughts, sensations and emotions of the moment and the context (in itself, an inclusive way of working).

The manner of the conversation is fundamentally important; we rarely prepare a script or list of questions to which we'll stick no matter what. Much of what we'll say is not directed at the topic of interest, but at getting to know the person a little. We'll ask leading questions, not because we lack interviewing skills but because we want to open an emotional channel to them, we want them to know we understand and empathise with their views, problems and aspirations. We do this in order that they open up more, so they allow us to see what they are doing, but also glimpse something of why they are doing it.

Knowing their motivations provides us with a level of information that is specific enough to inform and inspire the team, whilst being generic enough to point at alternate solutions – all should be relevant, many will be new.

We've found this to be of immense value, but it's not the only benefit of this way of working. In seeking an empathy with the user,

we find that the design team experiences an emotional engagement with the problems people face that is more than simply inspirational. As an example, the team working on the Mallinckrodt sleep apnoea mask interviewed several people who were experiencing severe problems caused by the apnoea; the team also spent sleepless nights using the conventional assistive devices. The resulting identification with the issues, and with the people living with these issues, motivated the team 'beyond the call of duty'. (Sleep apnoea is a condition in which people periodically stop breathing whilst asleep. This can result in sleep deprivation and physical stress, particularly to the heart. A common remedy is a tight fitting mask delivering a continuous positive pressure of air, which maintains an open airway. Conventional masks are inelegant, uncomfortable, noisy and restrict conversation and sleep.)

### Looking for inspiration rather than validation

Getting the right information from people and a deep emotional engagement with them is only part of the solution. Choosing the right people to do this with is key. The wider, more diverse the range of people you talk to, the better the information, broader the perspectives and divergent your thinking.

Our user research can emphasise the search for divergent content because later we will emphasise prototyping to identify the best ideas and directions to pursue. We can afford to be non-judgemental with our ideas at this stage because we know that we will counter this chaotic thinking with some honest evaluation with potential users.

One of our method cards is entitled 'Extreme users'. It describes how we frequently select the people we observe from the extreme ends of a distribution, rather than people who might be described as 'typical' or 'average'. We were designing a web and TV service aimed at creating communities, so we talked to a woman who had been sacked twice for overuse of online chat rooms. Her impassioned perspective on these interactions helped us to understand what she got out of her online relationships. In designing packaging for mineral water, we talked to a bicycle courier who explained how she navigated the city by water stations and helped us to understand needs for mobility that we all share to some extent.

We talked to people who drank pints of soft drinks every day; they had an understanding of the subtleties of soft drink formulation that



Shots taken with disposable cameras in Mexico: people buying and carrying drinks in small plastic bags.



Seniors with superior IT skills.

helped us to produce a new energy drink. We also asked contacts of friends and family across the globe to send back photos of people drinking. The range and ingenuity of portable drinking vessels allowed us to develop novel packaging solutions.

The idea of emotional engagement is powerful. We know the statistics – in 20 years every other person in Europe will be over 50, that seniors spend more time online than college students – but still, in our opinion, designers do not habitually consider seniors to be an important segment in the markets for high-tech products. Designers are not alone in this behaviour; product managers, marketing departments and market researchers all know the statistics, but fail to engage with the issues.

The way we counter this is, in part, through emotional engagement with the people concerned. We spent time in a Somerset village called Wedmore talking to a community of retired people who were teaching themselves how to use computers. We learned much about the difficulties of using PCs in an unsupported environment, about the emotional needs satisfied by email and about the unique perspective the elderly have of the rest of us. But some of the stories still resonate around IDEO. About Stanley, the 80-year-old clock restorer who taught himself computing so he could restore clocks better. He instruments his clocks with sensors and the software he's written allows him to see how circular he's made the cogs or how consistently he's fashioned the teeth. Or Margot, the 80-year-old in the 17th century cottage, who has had a PC for the last 20 years or more. Her husband worked for IBM and she was one of the first people in the UK to get a PC – when she was already in her 60's. She had an Internet service provider (ISP) well before IDEO London got one!

### Challenging preconceptions not seeking consensus

The value of Stanley and Margot is partly that they are ingenious, interesting and motivated people, and partly that they challenge a few preconceptions about how the elderly spend their time. Challenging preconceptions should be one of the main aims of design research, and the design process should be open to hearing these challenges. During this divergent phase all efforts should be aimed at postponing consensus, holding multiple points of view about the same thing, finding orthogonal views to support these different standpoints, assuming nothing and treating all input as worthwhile.

Whilst this is clearly something that is enabled by the right organisational culture, they are also behaviours that can be facilitated by project managers and design researchers. The environment also has its part to play – one third of the floor area at IDEO London is given over to ‘project spaces’. In these, the team will display all the material they have collected, they will exchange their different views and record all the perspectives they have gained: the space becomes the visual memory of the project. Each project space is as open as we can make it (client confidentiality respected at all times), we encourage non-team members to view, review, challenge or add to the material we present in the space.

## Prototyping the experience

Most designers will be familiar with prototyping the physical form as a way of communicating and exploring the weight, balance, colour, shape and material. Many of these physical forms will simply be vessels for electronics and software with which users will interact. We now have ways of simply and faithfully prototyping these behaviours and interactions, sometimes separately, sometimes within the designed form.

Even before we’ve chosen the physical form, or thought about the user’s interaction, designers decide (sometimes implicitly) on the experience they will create – will it be reassuring or challenging, will it be slick or whimsical, fun or business-like. We try to prototype these experiences. It is often extremely simple to do and revealing.

When asked by a major airline to consider what it might be like to sleep in economy class we prototyped the experience with some chairs and volunteers. The major issues soon became clear.

A colleague asked the project team to play a game with him. He blindfolded two people, one was asked to sit down with a water-filled balloon on his lap and the other was given two 50cm poles with pins sticking out of one end. A third person was told to give simple, verbal instructions to the person with the poles, the aim being to tell him how to take the balloon away without pricking the balloon and drenching his colleague. The people doing this were surgeons and theatre nurses, and the project was the development of remote robotic surgery equipment. This simple game conveyed the communication and control difficulties and enormous anxieties of the actual situation with next to no preparation or expense.



The experience prototype used in the development of the Kodak DC210 digital camera use interface.



## Bodystorming

How it might feel to sleep in economy class.

An implantable automatic defibrillator is a device that is surgically placed within the chest wall and, when needed, will shock the heart back into a regular rhythm. It will save your life, but ruin your day – the shock is sufficient to knock you off your feet. The team felt it was necessary to understand what this might be like and clearly it would be impractical to prototype this fully. One of the team distributed pagers, notebooks and disposable cameras to the rest of the team, client team included. Over the course of a weekend he paged individuals at different times and had them record what they were doing at that moment – the moment of their ‘shock’. On the Monday when everyone shared their stories they began to realise the personal and social impact of this remedy. One person was up a ladder, another holding his baby; the person entering a railway carriage realised the impossibility of communicating what had just happened to him and how easily that might lead to well-intentioned but potentially disastrous assistance.

There are three significant points to draw out of these stories. First, that we intentionally create prototypes we know to be ‘wrong’, but which are provocative and from which we’ll learn something. Second, the realisation of consequences that would otherwise be undiscovered until the device was developed and first used (the assumed value of prototyping). Third, the teams have shared a significant experience and understood how closely it resembled real life. This brought them together, engaged them emotionally and inspired them to do their best work in a way no other activity could have.

It is not sufficient just to know about ‘inclusive design’ and to have access to resources that guide and inform; designers also need to be motivated to do something about the problem. In the face of competing and conflicting demands, how does the project manager emphasise the inclusion of the widest possible set of users? This is something we deal with in chapter 12 ‘Connecting business, inclusion and design’ but we believe that emotionally engaging with people makes their inclusion unarguable.

### So, what is an inclusive design process?

The emphasis we place on all forms of prototyping has several benefits: not only can we better communicate design intent (itself an inclusive process), but we can more readily identify and engage emotionally with the issues, and we facilitate more complete user feedback and

design guidance. It helps to ensure that the designs our clients offer to the market are relevant, useful and usable.

Doing this activity well (often and early enough) means that human factors or design research resources can be preferentially deployed earlier in the process, when the need is for divergent thinking and discovering people's needs. We then have the time and energy to cast a really wide net, to look beyond the research that merely validates a design approach, to include input that challenges, provokes, disturbs and inspires.

Freed from the need to look exclusively for validation user input, designers no longer have to worry about who is in or out of the target user population, they no longer have to classify each project as 'inclusive' or 'mainstream', they can treat each equally. They can argue that the views of a 70 year old might inform the design of an MP3 player, or that voice interface software could be improved by listening to how the blind navigate the world, and that someone with learning difficulties could help us to design a better VCR interface.

Designers can recognise that, depending on the designed object and the context of use, we can all be rendered disabled; that disability can arise from functional loss or from contextual, social or cultural origins and, given the diversity of our user populations, this is highly likely to occur.

Inclusive design is not just about access to information about functional loss or to people with disabilities, though clearly that is important. It arises from a design process that is, in itself, inclusive. A design process that can accommodate (more than that, embrace) input that challenges, that at first glance is peripheral, that may be uncomfortable for a host of reasons. It is about having the right behaviours and the environment, project management and culture that supports them. Actively seeking information that challenges, having the techniques to gather it, the people with the right sensibilities and the organisational culture to deal with the resulting chaos, is how IDEO found itself with an inherently inclusive design process and how others could do the same.

## Acknowledgements

All images courtesy of IDEO

## Chapter 31

# Critical users in design innovation

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Each year, the Small Business Programme of the RCA's Helen Hamlyn Research Centre (HHRC) organises the DBA Design Challenge in collaboration with the Design Business Association (DBA), a major professional organisation of designers in the UK. Leading design consultancies are teamed with young disabled users and challenged to develop innovative scenarios for new inclusive products and services for the mainstream market. Now in its third year, the theme for the event is 'innovation through inclusive design' with projects undertaken to date covering such areas as packaging, mobility, product design, digital communications, 'smart' wearables and public and work environments (Cassim, 2001, Cassim 2002).

It is one of two major annual events of the Centre's Small Business Programme, which was initiated in 2000 to raise the profile of inclusive design among small manufacturers and service providers in the care and disability sectors. The overall aim is to help them identify and exploit innovation opportunities with the key focus being the development of new inclusive products and services that span niche and mainstream markets.

The DBA Design Challenge takes place over a period of three months with the resulting prototypes and scenarios presented at a public event at the Royal College of Art. This brings together representatives from the design, disability, voluntary, academic and business communities. All the constituencies that are key to change in a sector where design standards are conspicuously low and cross-sectoral collaborative projects are rare despite the innovative mainstream potential of much of the assistive technology developed for the 'special needs' market. As such, the Design Challenge is a strategic tool with specific and general purposes.

Firstly, it is a mechanism to promote dialogue and collaboration between these key players with the user experience central to the process. Secondly, it is a means by which inclusive design exemplars can be developed and used to generate new examples, albeit in a time span far more concentrated than that of the average design project. This is important in sectors where inclusive design may be understood separately in theoretical, ergonomic, technological or engineering terms but where visualising what it means in the context of products or services for the mainstream market may be difficult even for designers.



Visually impaired user advises Design House on website design.

For the participating DBA design firms, it is hoped that the experience of working closely with 'critical' users will result in a transformation of their working practice or, more modestly, a raised consciousness of the importance of inclusive design methodologies companywide.

The high profile nature of the event and its competitive nature – in the second year, it was reconfigured as an inclusive design competition at the request of the DBA – is also a strategic means of alerting the design community to the creative potential of engaging with disabled users and demonstrating how this can help a firm expand its creative and commercial competitiveness into areas they may not have considered. Similarly, in the small business sector, it is hoped that the beacon prototypes generated by the Challenge will exemplify the key role played by the inclusive design process in innovation and in development of their own market position and brand.

The triggers for the Challenge were first, the fact that the same process had been used with great success in the early days of the DesignAge programme at the RCA and second the publication of two official reports in 2000. One by the UK Audit Commission (Audit Commission, 2000) highlighting the poor levels of design endemic to the disability aids and equipment sector; the other by the UK Department of Trade and Industry (DTI, 2000) describing the difficulties experienced by disabled people in using everyday consumer products.

To date fourteen design consultancies have participated. In each case 'critical' users are chosen to push design thinking – visually impaired users for a website design, physically impaired users for a customisable 'drive by wire' vehicle interface, and a clothing collection, and arthritis sufferers for a packaging project. Most projects, however, involve a mixed group of 'critical' users whose disabilities are pertinent to inclusivity issues arising from the scope of the project. For a packaging project, this may involve people with arthritis who can illustrate the problems of impaired dexterity and grip; stroke patients for those relating to single-handed use and partially sighted users who can talk about the impact of limited or no vision on graphic or other interfaces. Such users help designers think laterally across the user needs spectrum thus avoiding the pitfalls of concentrating exclusively on the needs of a single disability, which may in turn limit the mainstream potential of the final prototype.

## Design development process

The consultancies are initially briefed on the overall purpose of the project and given customised 'toolkits' consisting of a conceptual framework for inclusive design – demographic, legislative and other data; case studies, user-research methodologies, appropriate website links, and contacts with experts in the area under study whom they can consult at all stages of design development.

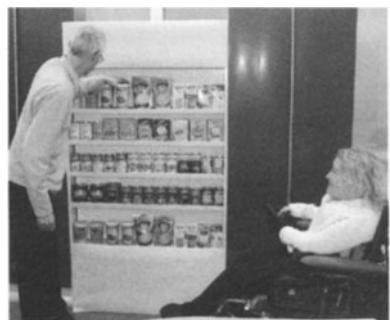
With the context established, a two-hour project-specific forum of 'critical' users is organised for each design team. The design teams are mentored throughout the design process by the author, individual 'critical' users and other experts until their final presentations at the event itself. To extend the geographical reach and impact of the Challenge, it is documented in the Small Business Programme's research journal 'Innovate' and disseminated via the Helen Hamlyn Research Centre's website, through presentations to a variety of academic, industry and voluntary sector bodies and at an annual exhibition at the Mobility Roadshow, Europe's largest disability-related mobility event.

## The empathic model

A crucial element in the DBA Design Challenge and the other programmes of the Helen Hamlyn Research Centre is the empathic model built into the heart of each. This is predicated on the direct engagement of the designer primarily through the medium of the user forum with the physical, cognitive and sensory needs of the user and importantly their lifestyles and aspirations. With its focus on the needs of ageing populations, the DesignAge programme pioneered this idea of matching designers with older users who could illustrate the limitations imposed by the multiple minor impairments of age such as reduced vision, hearing, mobility and dexterity and help them reach mainstream design solutions which accommodated these needs. For the DBA Design Challenge, the focus shifted generationally to younger users with disabilities that are more severe in nature whom we term 'critical' users. It was a deliberate strategy, for the reasons outlined in the following sections.

## Shared lifestyles, shared aspirations

In marked contrast to the expert users who had participated in the DesignAge programme, 'critical' users offer a different consumer



Users evaluate supermarket project by kinneir Dufort and The Alliance Studio.

**The more constraints there are, the more creative designers have to be**

profile. Being young, they present a design scenario based on active social engagement. A long life lies ahead of them with all this implies in terms of a desire for access to mainstream products, services and employment opportunities. Design can be said to be a young person's profession as exemplified by those who have participated to date in the DBA Design Challenge, all of whom are aged below forty. Thus, the users are the designer's contemporaries not their parents or grandparents with an equivalence of lifestyle and taste existing between the two groups.

While there may be radical differences in the physical and material conditions of their lives, designers and young 'critical' users tend to share common cultural tastes and aspirations, an aspect which helps to rapidly establish empathy between the two groups and affords the designers insights into alternative versions of a shared reality. Adrian Berry of Factory Design indicated its importance in relation to design strategy and product development in general. Speaking of a user with arthritis who served as an advisor on their packaging project, he noted:

We do a lot of lifestyle assessment ...and will present lifestyle research to companies as a strategic part of the product design process. When I spoke with Dawn, her lifestyle was just like my lifestyle – the things she wanted – it's just that she had more problems than I.

### Focus groups versus user forums

Empathy aside, being able to identify the precise nature of user needs is of key importance to the inclusive design process and the focus group is one of many tools employed for this purpose. Interviews conducted with eight of the nine DBA Design Challenge teams (Cassim 2002, Hua Dong et al., 2002) revealed that while focus groups were a common feature of commercial design projects, the designer's 'fly on the wall' status and lack of control over the selection of participants militated against any substantive analysis of usability issues other than those defined by the market research aims of the project. Hence, while observational data could be gleaned by designers from such sessions, the participants were likely to be drawn from narrow age bands and unrepresentative of the multi-generational diversity of needs and abilities

that inclusive design seeks to address. This contrasted strongly with their experience of user forums organised for the DBA Design Challenges. Of all the design tools and resources at their disposal, the participating designers cited the ability to directly engage with ‘critical’ users as being the major factor enabling them to push the design envelope since it supplied them with a set of creative triggers that stimulated key features of their final designs. (Cassim 2002, Dong et al 2002)

### The critical user as design assessor and innovator

Young ‘critical’ users represent the extreme end of the usability needs spectrum, not its middle reaches, as would be the case with many older users. For this latter group, their disabilities may be multiple but are often minor in nature and more easily compensated for in lifestyle and design terms. Indeed they may not even identify them as disabilities, but inevitable inconveniences of growing old. In contrast, the severity of disability experienced by the ‘critical’ user tends to give them a more acute understanding of design failure and the ability to articulate both the problem and their idiosyncratic or common response to it.

This was exemplified by one visually impaired user involved in the Design House user forum for a website that could be navigated easily by people irrespective of their sight (case study 1). He had devised a means by which the much-maligned ‘cookie,’ could be subverted and customised, thereby stripping it of its negative ‘junk mail’ qualities and transforming it into a feature, which aided rather than hindered his navigation of a site. This ability to assess a product thoroughly and then offer alternatives to negative aspects of an existing design was cited by Alloy Total Product Design as being the key factor that enabled them to rapidly establish the hierarchy of issues needing to be addressed in the final design for Kettlesense (case study 2, and also see chapter 15, Everyday inclusive design). As Nina Warburton, commented:

When buying products, people with disabilities tend to look beyond the product features for potential problems that may prove difficult or prevent them using it. They plan very thoroughly what they can and cannot do.

**People with disabilities tend to look beyond the product features for potential problems that may prove difficult or prevent them using it**

I have probably seen hundreds of briefs for different projects, ... designing solutions to be as inclusive as possible has never been a primary, secondary or even tertiary requirement of any

## Design from first principles

A common perception among designers with no experience of the inclusive design process is that severity of disability places limitations on the design process with fatal creative compromise as the inevitable end result. "Designers think of inclusive design as being a ticking the box exercise" said one design manager (Cassim, 2002; Dong et al., 2002). In contrast, the participating DBA design teams found it an invaluable discipline, forcing them to go back to first principles in concept development and not merely reconfigure an existing product or service cosmetically. "The more constraints there are, the more creative designers have to be" was the response of one designer to the question as to whether they found the needs of 'critical' users hampered them creatively. It was echoed by the others interviewed.

The design solutions that emerge from this process tend to be more innovative in nature although the final product may not meet the entire range of needs of a particular disability. A visually impaired user who participated in the two user forums associated with Imagination's Inspiration-Park (case study 3) commented, "I don't want a spacy park" – in other words they aspired to mainstream and not stigmatising special needs design but were prepared to accept a design solution that may not meet all of their needs but was inclusive in its foundation and basic features.

## New communication modes

Two other aspects of the different consumer profiles of older and younger critical users became apparent in the user forums organised for the Design Challenge. They have particular relevance to projects involving communications or product interfaces. Older users may be wary of design solutions involving technology or the manipulation of unfamiliar interfaces whereas many young users are computer literate, product literate and technology 'savvy' to a high degree.

In the case of the Design Challenge, this has been due in part to the enthusiastic involvement of volunteer members of the British Computer Association of the Blind (BCAB). Many are employed as software engineers or designers, a profession, which has happily expanded the employment options of visually impaired people. However, even individual users who are not part of the BCAB network

share this same reliance on and expert knowledge of mobile phone and computer technology and interfaces in particular. Their major modes of information gathering and communication are more likely to be based on their use than on such traditional printed forms as Braille and Moon. These have low literacy rates (RNIB, 2002) and are less popular, relying as they do on third party transcriptions of the original, a process that places an editing filter and time lag between the original information source and the user. This is not the case with the new speech-delivered technologies where access takes place in real time and is independent.

Familiarity with leading edge technology is true not only for visually impaired people. Any disability acquired early in life and of sufficient severity will require the individual to develop alternative modes of communication, information gathering or mobility. The extensive use of assistive technology aids by those with severe mobility impairments, for example, means that this group must master complex interfaces to equipment or environments if they are to achieve even a minimum level of independence. The interfaces may be technologically innovative but are often extremely primitive in aesthetic or design terms.

Nevertheless, they afford designers a glimpse of radical alternatives to standard consumer behaviour in situations where sophisticated assistive technology is used and flexibility of response is the key. Stigmatising though these aids may be, the technology itself can benefit existing consumer products that require hands-free or remote operation while the scenario in which they are used lends itself to innovative extrapolation for more mainstream situations. This combination of factors has proved fertile ground for the DBA design teams resulting in ideas for new generations of products, such as the 3-D printer that Priestman Goode proposed for the first Design Challenge. This combined the possibilities of rapid prototyping with those of Internet shopping sampled in 3D (case study 2).

**Ergonomic data involves specific measurements but this is not the language that designers speak**

### Coping strategies and out-of-the-box thinking

Older users whose disability was acquired in mid or late life may not have mastered such alternative modes of doing things. Where they are visually impaired, the condition of their hands or their lack of access

**The insights that emerged from the user group and the resulting ideas were a result of a co-operative exchange of viewpoints from some very inspiring people**

to specialist education means they may neither read Braille nor have mastered the computer or even developed the sophisticated coping strategies displayed by younger disabled users (Cassim, 1998). Hence the scenario they present to the designers is more likely to be based on inability than positive alternative ability, which younger users bring to the user forum along with their unsurpassed technological expertise.

This aspect has proved particularly exciting in creative terms to the DBA designers who belong to a profession that prides itself on its ability to think 'out of the box' and yet may not come into contact with situations where this is required or actively stimulated. Only three of the nine teams who participated in the first two Challenges had ever worked to an inclusive brief and their personal experience of disability was limited. As Adrian Caddy of Imagination noted:

As Creative Director of the company over the last ten years, I have probably seen hundreds of briefs for different projects. In my experience, I have to tell you, designing solutions to be as inclusive as possible has never been a primary, secondary or even tertiary requirement of any. (Cassim, 2002)

In many of the projects undertaken for the DBA Design Challenge, exposure to the highly developed coping strategies of the disabled users has offered the designers lateral ways of dealing with standard scenarios and in many cases been the trigger for the truly innovative features of their final designs. Imagination's Inspiration Park (case study 3) for example, has a wealth of detail that can be traced directly to issues raised in the user forum - one visually impaired user's fear of open spaces based on her inability to pick up the sound cues supplied by the built environment; her need for clear navigational configurations of space and in particular her terror of open stretches of water were directly translated into innovative design features which reconciled her love of the sound and sensation of flowing water with her primary need for safety.

Separate issues were raised by wheelchair users who cited their desire for an all-weather environment while a user with a cognitive disability required instinctive wayfinding indicators, which were not language based. In this way the design team was forced to think

holistically and strive for a design balance that reconciled the diversity of expressed needs but was mainstream in its aesthetic.

Communality of difficulty experienced by users with different disabilities also provided the combined trigger for creative solutions in 'Kettlesense', Alloy's radical rethink of the conventional kettle (see chapter 15). Users with arthritis talked of their difficulties with the weight of conventional kettles and their fear of injury caused by burns or scalds – one shared by the 112,000 people annually in the UK that a 1998 DTI study found are obliged to seek hospital treatment as a result of such injuries (DTI, 1998). A visually impaired user echoed this fear, offering her own coping strategy, which was to dispense with a kettle altogether, fill a mug with cold water and heat it in the microwave. This led the designers to base their final design on one that eliminated the need to carry or pour boiling water and instead allowed the user to fill a two-handled container with the desired quantity of cold water. This could then be boiled and dispensed in a fail-safe method from a percolating tower.

Sometimes these creative triggers for design innovation are subtler, related less to usability issues and more to the psychological climate driving consumer behaviour. In one forum for a clothing collection, users with a range of disabilities spoke of the importance of body image to them and the conflicts it generates in relation to clothes buying. Visually impaired users spoke of their anxiety at being stigmatised by clothing which was mismatched or generationally inappropriate and their strategy of bulk buying branded items or selecting clothing only from shops recognised as being in the forefront of high street fashion. A wheelchair user spoke of the barriers in retail environments that stop her using them in the first place and the conflicts she experiences in reconciling her need for fashion with function. For example, how should she balance her desire for clothes that positively enhance her self-image but which may have features that actively harm her like the thick seams on jeans which can promote pressure sores?

Taken together such insights provide a rich source of anecdotal and contextual data, which can inform a project and send it in the kind of unanticipated directions that lead directly to new product ideas. For many of the DBA design teams it was their data of choice over more



'C' system swing tags by Coley Porter Bell.

traditional forms as one designer noted: “Ergonomic data involves specific measurements but this is not the language that designers speak. The information is there but is not accessible. Designers tend to go by personal experience hence the importance of the empathic approach.” (Cassim, 2002, Dong et al., 2002)

### The importance of a permanent framework

Examples abound of critical user involvement in one-off design projects but those of long-term commitment to the improvement of design or service standards through inclusive design are harder to find. The diverse measures initiated under B&Q’s equality and diversity programme (Cassim, 2001) are an example from the corporate context, while the activities of the Helen Hamlyn Research Centre straddle the corporate, educational and design worlds. The success of both initiatives rests unequivocally on the fact that they are ongoing, not temporary, and take place within the structure of established programmes. As such they have been able to develop credibility, trust and support from all constituencies over time as well as a body of replicable exemplars of theory transformed into practice.

### The logistics of critical user participation

At the Helen Hamlyn Research Centre, critical users are drawn from an expanding pool of collaborating individuals and organisations, including AWEAR, Arthritis Care, the British Computer Association of the Blind, Chelsea Elders Contact Organisation (ECCO), Different Strokes, East Chelsea Community, Elder Designers, Foundation for Assistive Technology (FAST), Herts. Action on Disability, SHAPE, Open Age Project and University of the Third Age. For the Design Challenge, users are hand picked, matched to each project and invited to attend a user forum held at the Helen Hamlyn Research Centre for reasons of access and transport convenience. Many disabled users require flat access to buildings, disabled parking spaces or central locations that are easily accessible by public transport. They have widely differing degrees of mobility – some require door-to-door assisted transport, others can negotiate different public transport modes but may need to be met at their destination station or accompanied throughout all or part of their journey. These logically complex considerations are factored into the user forum planning process and arrangements made in advance

with individual users. On average, user forums last two hours with a break for refreshments and attention paid to the tiredness levels of participants. The number of users range from a minimum of four but allowance is made for last minute absences due to illness or such reasons as a carer failing to appear at a designated time. Hence a larger number of users are invited than may be required.

User forums have proved extremely effective when held at the concept development stage of the design project with a further session midway through the process. In the DBA Design Challenge this constitutes the stage where the design team will have decided on an overall theme or concept, have studied the project specific resource pack provided by the Helen Hamlyn Research Centre and discussed the project with the author and recommended experts. Thus, they have some understanding of the context of inclusive design and the project direction. However, for many of the designers it will be their first experience of meeting severely disabled people and some express anxiety that they may inadvertently offend hence the need for a briefing session before the user forum takes place.

### Nature of the user forum

The participating DBA teams are advised to document the user forum through video or sound recording but are left free to conduct the sessions as they wish. The nature of the project and the design team's usual working practice tends to determine how this is done. Some prefer highly structured sessions using well-established investigative procedures involving the use of whiteboards, questionnaires or audits of existing products. For the latter, the usability of each is scrutinised and alternatives suggested or sketched and evaluated on the spot. None of the sessions where these techniques were employed have centred on blue-sky concepts but rather the rethinking of an existing product from first principles as in Kettlesense and case study 4. Where the projects were 'blue-sky' in nature (case studies 2 and 3), the forum took the form of free-form brainstorming. For Imagination's Inspiration Park (case study 3) a multi-disciplinary team of designers made up of a creative director, design manager, writer, architect and graphic designer participated. This 'blue sky' type must be effectively chaired, however, to ensure that there is a balance of opinion, no single individual dominates the discussion and all relevant issues are covered.



Users comment on packaging and openability.



In many of the projects, the design team has then gone on to consult individual users from the forum until the development of the final prototype. For example, Coley Porter Bell worked closely with Rebecca Harris, a congenitally blind artist who was the lead designer's exact contemporary to develop the c system which won the Inclusive Design Award in 2002 (case study 5.) In all, five sessions were held over a six-week period with two further contextual sessions held with the author in addition to the user forum organised for the project. This level of input is, however, exceptional and was related to the project being an extension of the author's research. On average, the design teams have required two to three sessions of intense user contact - the first to generate ideas and the second to gain feedback from developing prototypes – in addition to the other forms of project mentoring described.

### Selection of participants

A deliberate strategy of the DBA Challenge user forums has been to match the designers with users with disabilities that will directly challenge the ingenuity and preconceptions of the design team. For Renfrew's design of an inclusive vehicle interface based on drive by wire technology, the lead user was a computer engineer with cerebral palsy and little use of his hands who uses his feet for all activities including driving. (case study 6) Since a high proportion of disabled drivers are paraplegic and use hand controls, many vehicle adaptations are based on this principle and existing solutions abound. As a result of having to address the needs of this user, the design team was forced to think of both scenarios simultaneously and the final design was innovative to a high degree.

A similar example of this strategy was Imagination's Inspiration Park (case study 3) where visually impaired users represented the core user group and not wheelchair users although the latter were represented. It was a deliberate means to challenge any pre-existing assumptions on the designers' part on the impact of poor environmental design on people with disabilities and widen the discussion/scenario to include areas that they may not have considered. The team had been involved in public projects involving the built environment, all of which are governed to a degree by access legislation, in particular access by

wheelchair users. A wealth of architectural and design information exists on this subject and the designers were aware of the need for the provision of ramps, lifts and other standard features.

It was also possible for them to simulate the experience of mobility impairment by using a wheelchair in the kind of space that they were considering designing. In contrast, sensory or cognitive disabilities are far more difficult to either simulate or imagine and their effects on perception in relation to objects or environments are less well documented. The author has worked extensively in the area of physical and cognitive access for visually impaired people to museums and museum collections of art and artefacts and curated exhibitions of art by visually impaired artists. (Cassim, 1998, 2001 and 2002) Thus, she was aware of the powerfully stimulating impact that the meeting of two sets of creative people with different sensory vocabularies can engender – the user forum included a blind artist, a composer, a singer and a former writer with an acquired cognitive disability resulting from a stroke. The wheelchair user ran his own advertising company. The resulting design reflected this inspirational meeting of minds to a high degree as the creative director noted:

We were forced to think and work very differently from our usual practice. The insights that emerged from the user group and the resulting ideas were a result of a co-operative exchange of viewpoints from some very inspiring people. (Cassim, 2002)

### **The ethics of user participation**

The employment statistics relating to the disabled population make for depressing reading despite the work avenues opened as a result of the IT revolution and the Disability Discrimination Act (DDA) of 1995. (Employers Forum on Disability, 2002) The DDA has meant that disabled people can now work as access consultants particularly in projects relating to the built environment or public services.

Overall, of the estimated 8.7 million disabled people in the UK, 5.2 million are of working age yet only 42% are in employment. This has implications for any design project involving critical users and raises important issues regarding monetary reward. Although the Design Challenge projects involve commercial firms, all parties view them as



Users evaluate packaging concepts.

educational in nature. The projects are self-funding with the design firms working in their spare time and the user forums financed by the Helen Hamlyn Research Centre. Critical users are not paid, as would be the case for focus groups in the commercial design world although their travel expenses are reimbursed, irrespective of the means of transport. They are in essence offering their specialist expertise as volunteers. This raises the question as to whether such expert knowledge should be rewarded, as it would be in projects in the commercial world where able-bodied consultants are hired as technical advisors and paid accordingly. This is an issue particularly for projects which may be in direct competition with the critical users' professional practice or where their knowledge contributes directly to product concepts that are then developed commercially (case studies 1,2, 4, 5 and 6)

At present the rarity of 'critical' user input into design projects other than those related to the built environment means there is no established set of procedures or guidelines to which design firms can refer. Perhaps now that the compelling creative and business case for inclusive design is increasingly being made as a result of such projects as the Design Challenge, it is a discussion whose day has come.

## Case Study One

### The company

Design House

### The project

Broadband internet site – an accessible website for a sports-based web channel to allow access by all.

### The user group

Blind and partially sighted expert users.



### Key issues

- Complex or irrelevant search engine results
- Captionless images
- Poor navigation and information architecture
- Inability of sites to be read by screen-reading software
- Worries about credit card security for internet shopping

### Design solutions

- Information buttons zoned top allow screen-reading software to read screen in set order
- Content zoned for primary and secondary navigation
- Choice of colour combinations geared to colour blindness syndromes
- Link included to monochrome version for total contrast
- Printable version for users requiring hard copy
- Pettings button introduced to allow for customisation of screen.

## Case study two

### The company

Priestman Goode

### The project

Sensory Web – a 3-D printer for Internet shopping which allows images to be downloaded as 3-D objects.



### The user group

Blind and partially sighted expert users (computer and raised image related).

### Key issues

- Lack of information in appropriate format
- Inability to shop independently
- Inability to assess or compare products
- Worries about credit card security.

### Design solutions

- The design harnesses stereolithography the rapid prototyping technique widely used in CAD/CAM manufacturing. This enables the building of complex three-dimensional models through laser forming cross sections of liquid resin using CAD data systems.
- Sensory Web is a domestic 3D printer with a rotating disc that moves from left to right and is gradually lowered as the surface of the object is constructed layer by layer. Tactile interfaces for mobile phones and mini-disc players and portable tactile maps were some of the products envisaged.

## Case study three

### The company

Imagination

### The project

Inspiration Park – an all-weather concept for a small-scale inner city park.

### The user group

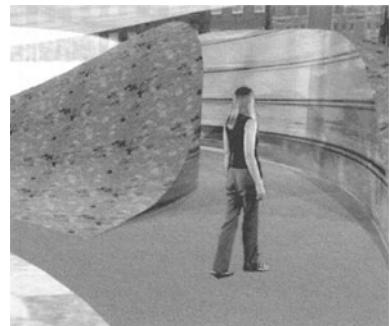
Visually, mobility and cognitively expert users from the creative industries.

### Key issues

- Safety and personal security
- Ease of navigation
- Information in appropriate format
- Serendipitous socialisation
- Sensory stimulation
- Creative play
- Integration through design.

### Design solutions

- Transparent canopy roof for protection from elements which channels rain to central water feature
- Defined boundary to act as sound barrier
- Wide welcoming entrances
- Clear navigation system for independent exploration
- Pathways of tough compound rubber for safe and comfortable surfaces
- Play, art, nature and water zones with features to stimulate senses and social interaction
- Embedded sound, lighting and communications systems to enhance experience and provide essential security and information.



## Case study four

### The company

Factory Design

### The project

Milkman – A user-friendly alternative to the standard milk carton.

### The user group

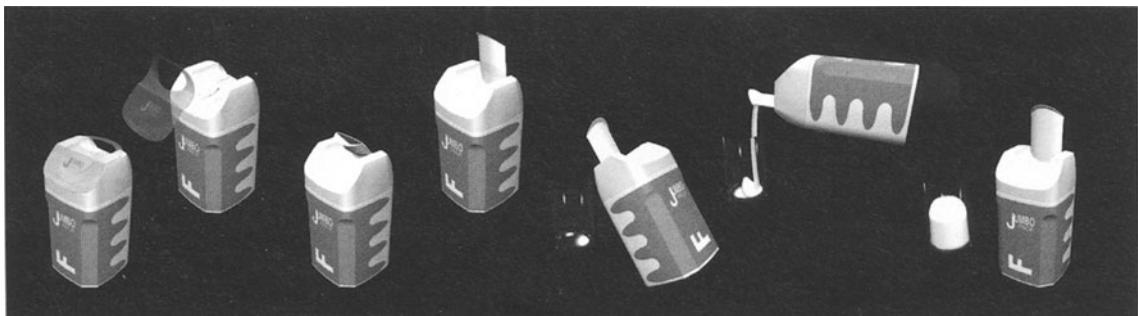
Consumers with severe arthritis.

### Key issues

- Risk of injury through manipulation
- Ease of opening and pouring without recourse to gadget
- Optimum maximised grip without risk of spillage from tendency to over-grip
- Cost effectiveness
- Shelf presence and stackability.

### Design solutions

- Inspired by the idea that a kink in a garden hose will cut off the water flow, Milkman is a folded card carton with:
- A tamper-proof seal which is nevertheless easy to remove
- Pouring spout that seals contents when folded back
- Rubberised ink grip detail on side of carton
- Chamfered corners.



## Case study five

### The company

Coley Porter Bell

### The project

'C' system – a smart clothing tag system consisting of a tactile code of shapes representing colour and size with a bar code reader for additional product information.

### The user group

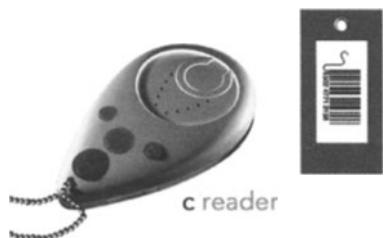
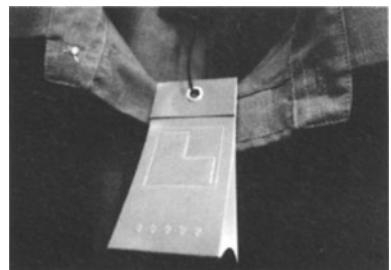
Young blind and partially sighted artists, and consumers of all ages, with and without visual memories.

### Key issues

- Inability to shop independently.
- Reliance on others for information on style and colour.
- Difficulties of selecting and co-ordinating outfits instore and at home.
- No access to care instructions and other key data.
- No standard system in colour coding for other products.

### Design solutions

- A tactile language of sixteen shapes representing core colours enabling over 60 shades to be identified. Each core shape is enclosed in a square with a raised keyline. The inner shape is further subdivided into four, creating four shades of decreasing saturation as one segment is removed from the whole.
- When the shape is ribbed, the garment is patterned; when plain it is plain.
- The tactile colour code is printed in relief on a garment's swing tag along with the colour itself, its name in large print and Braille and a sizing code of five raised circles ranging from extra small at one circle to extra large at five.
- The bar code on the reverse side provides more detailed information on style, care instructions. A swipe with the portable bar code reader delivers this in audio. A permanent silk c label sewn into the garment with the tactile shape enables long term identification.



## Case study six

### The company

Renfrew Group

### The project

Personalised driver interface (PDI) – an adaptable driver control that can be configured to individual driver's needs.

### The user group

Young expert user with cerebral palsy. Designers used the Ford 'Third Age' suit to simulate multiple minor impairments.

### Key issues

- Flexibility of control interface to allow alternative driving modes that are not dependent on upper body movement or strength
- Ease of adaptation to individual drivers of same vehicle
- Maximum visibility to eliminate blind spots and view hazards with limited body movement
- Integration and simplicity of controls
- Ease of access to vehicle
- Elimination of need for expensive adaptations.



### Design solutions

- Use of drive by wire technology to eliminate conventional steering controls
- Pressure-sensitive handles to regulate speed
- Separate braking levers
- Intuitive control of interface
- Wide screen display console to give panoramic view of driving environment
- Use of smart card for driver customisation

## Acknowledgements

Chapter title page image: Rob Williams, who advised SeibertHead on drinks container project and Renfrew on the driver interface project. Images courtesy the design consultancies and Julia Cassim.

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# Future views

## **Future views**

In this final section, six contributors polish the crystal ball and look ahead to a more inclusive future in which human need, new technology and intelligent design improve lives and create wealth.

Graham Pullin anticipates a growing role for inspiration, intuitive responses and a lightness of touch to avoid inclusive design becoming too dull and worthy. His argument is for diverse needs to be addressed by a diversity of design tactics.

Alan Newell of the University of Dundee examines market trends in the area of communication and information technology – leading to new computing interfaces that will be more dynamic, adaptable and inclusive.

Mike Woods of product design firm Tangerine explores the emerging implications of digital technology, and Stephen Wilcox and Eric Callahan explain how remote interactions will change our world, and why such inclusive developments will prove particularly valuable to those with severe disabilities.

Roger Coleman rounds things off in the final chapter with a preview of the forthcoming British Standard in inclusive design and other guidelines set to emerge in this challenging arena.

## Chapter 32

# Inclusion, inspiration and lightness of touch

**Graham Pullin**  
IDEO London



Whilst inclusion is a growing agenda, a difficulty in pointing to truly inspiring examples of inclusive design might indicate that it has yet to deeply engage designers and their clients. This will happen when it becomes more widely seen as a source of design inspiration as well as social obligation, when it comes to be seen as opening up exciting new territories, not just presenting new problems. Those seeking inclusively designed solutions have, in their turn to, become more receptive to design sensibilities. To be open to more challenging solutions and to place more value on the restraint that so often characterises the very best design; to aspire to a lightness of touch.

Inclusion is an issue set to influence design for the better (others are sustainability and cultural diversity). Welcome legislation will make inclusion more of an obligation, but inclusion also needs to become an inspiration to designers. The mechanism for, and result of, this is that inclusion will need to be open to more challenging new directions that will ultimately benefit its cause.

At the same time design itself is also changing as the distinction blurs between products, services and environments and this in turn will influence inclusion. To design within, and sometimes create, systems that involve infrastructure, information and tangibility requires new perspectives on both design and inclusion.

Visions of the future often rationalise the diversity of human behaviour ("In the future everyone will..."), and so 'inclusiveness' can come to mean 'universality'. Instead I argue for an approach where resonance is sought between the diverse needs of different groups of people, and a diversity of restrained and appropriate tools are designed.

## Inclusion influencing design

Inclusion is an issue set to influence design for the better as are sustainability and cultural diversity. Recent and forthcoming legislation, covered in more detail in chapter 8 'The legal argument for inclusive design' will demand that more attention is given to designing inclusively, but I believe that we can aspire to a more fundamental engagement than even this. Clearly, as is to be welcomed, the need to design inclusively will broaden the responsibilities of the design team further and extend current practises of user-centred design.



Chair by Ray and Charles Eames.

## Obligation and inspiration

Beyond being seen as an obligation, designers could do more to engage with inclusion as a source of inspiration. Then inclusion could open up exciting new territories. In view of the scarcity of examples, I'll reach for an analogy not in design for inclusion, but design for manufacture: These days we expect that a designer or design team's responsibility extends to creating a design that is ultimately manufacturable or implementable. Sometimes that involves an individual designer developing a broad understanding of the properties of materials and the possibilities of manufacturing processes; sometimes it involves working in multidisciplinary teams with specialists.

To pick a well-known (and timeless, if not contemporary) example, the pioneering work of Charles and Ray Eames in the 1940s in developing furniture with formed plywood was driven by the manufacturing techniques at its heart. With new forms and visual languages possible, manufacturability was an inspiration not an obligation, and as a result at the very centre of the design process, not added on at the end.

## Openness to disturbance

As someone who has been involved for 17 years in designing products for people with disabilities (amongst other design), I confess to mixed feelings about the standards and spirit of much 'inclusive' design. 'Worthy' it surely is, but often lacking in passion and excellence. I look forward to the day when the enfants terrible of design aspire to inclusion as an inspiring territory to explore. Design culture builds in this way. Designers thrive in equal measure from inspiration and information. General trends and legislation will shift the centre of gravity, but inspiring design icons and heroes can complement if not exceed this influence by advancing the cutting edge.

When such work does appear it will be necessary to place it in context. Radical design may be ignored or dismissed, but it is needed to advance mainstream design. Ray Eames' sculptures in formed plywood explored and defined the design language of the practical furniture that she and Charles Eames later designed together. Inclusive design could be like this – as much about opening up new territories and possibilities, as resolving practicalities (although clearly the two

are inseparable). This could do more to secure the attraction of the best talent to inclusion as a way of designing.

If it is possible to get that level of engagement we can succeed in pushing the boundaries of utility, culture and taste within inclusion, with social attitudes being played out in the design arena. It will also be easier to wrestle with the practicalities of delivering inclusive and diverse design answers if appetites for success amongst designers, clients and their customers have been so stimulated.

## Design influencing inclusion

At the same time design itself is also changing as the distinction blurs between products, services and environments. Networked products are as much defined by the service behind them as their physical design; services are being made tangible through products and physical environments; environments are becoming intelligent, interactive and networked.

Clearly inclusion also inherently involves products, services and environments. Access to some services may involve a complex mixture of all three. We are learning to design within, and sometimes to create, systems involving infrastructure, information and tangibility. This in itself requires new perspectives and practises from which inclusion could benefit or influence.

## Emergent behaviours

This change of perspective is a bigger change than it at first appears. Conceiving a product in the context of a system, or the system itself, is more complex than just considering the interaction between an individual person and an individual product. Beyond possible interactions between products are person-to-person interactions mediated by technology, and even one-to-many and many-to-many interactions (for example within communities).

IDEO recognise a number of skills needed to grapple with this complexity. Designers work in a multidisciplinary environment underpinned by strong human factors, psychology and ethnographical factors as a fundamental part of the design mix. A substantive discipline of interaction design creates design intent from this understanding. Perhaps most importantly, a strong core technical competence and





Chair and standing frame by James Leckey.

prototyping capabilities allow building and testing of ideas at a divergent stage of the design process.

Especially with systems and communities, the behaviour of the whole cannot always be predicted from that of the individual parts. Prototyping ideas very early in the (still divergent) concept development phase and seeing what happens, before heavy commitments have been made, allows an open mind to change. We believe that it is essential to get our hands dirty and learn, then to make decisions. Many of these approaches can be characterised as emergent design behaviours.

### Inclusion and diversity

Visions of the future often rationalise the diversity of human behaviour. "In the future everyone will..." go the predictions, and so 'inclusion' can come to mean 'universality'.

So visions of 'inclusive products' are too often interchangeable with those of 'universal products'. Products that both do everything (because different people want to do different things) and are accessible to everyone.

This is controversial for at least two reasons. The debate over the 'convergence' of discrete products into integrated platforms will continue to ebb and flow with fashion. Personally I am resistant to it, but more significantly I know that it is controversial even amongst people currently badly served by excluding design. One blind friend wishes for nothing more than an integrated (and accessible) solution for his mobile needs (Braille-Lite, PDA, phone...); another would prefer a selection of optimised products including a phone offering no more than accessible voice and text messaging in order that it might be as compact and attractive as other phones.

Beyond this there is always an inherent danger in trying to design any product to be 'all things to all people'. James Leckey, the designer and manufacturer of furniture for children with disabilities, uses the phrase 'flying submarine' to describe a product specification overburdened with comprehensiveness and so doomed to over-expense, over-compromise and (perhaps most importantly) mediocrity in each of its uses.

## Inclusion and focus

Much better to design with particular user needs in mind. Different people have differing circumstances, abilities, goals, priorities and contexts (and these change over time). If the focus is determined by ability, by 'able-bodied' needs, then clearly this is not an inclusive approach. If however the focus cuts across issues of ability and indeed looks for resonance between the contextual needs of otherwise 'able-bodied' people and needs arising from particular disabilities, then such a focus can after all contribute to inclusion.

For example, there is resonance between the needs of people with visual impairment with those of anyone needing to have 'eyes-free' interaction in a particular context. The same applies to dexterity impairment and 'hands-free' interaction, and hearing impairment and the use of products in noisy environments (or even in environments that need to be totally silent). Resonance between cognitive impairment and the need to use a product without devoting it complete attention or concentration, or the cultural issues when in an unfamiliar context or circumstance, are also interesting.



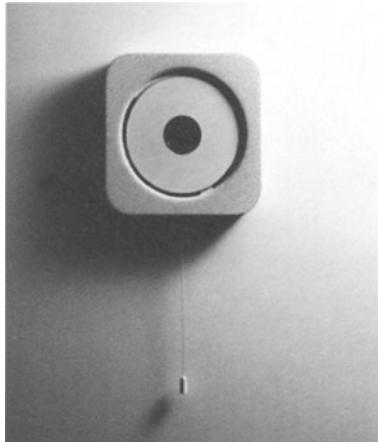
Experimental mobile phone by IDEO.

## Restraint and diversity

On the whole, tools that do one thing really well and deliver a high quality experience are better designed. This view unlocks them, enabling them to be simple to understand, it allows them to be picked up and put down and allows designers to grapple with issues that are not primarily about accessibility. A designer does a better job of inclusion when other complex needs are balanced as well.

This leads to a view of products as tools to be used only when needs and circumstances suit. These days it is information, whether personal data, communication media or consumed content, that is likely to be 'worked' using such tools. A vision of a distributed infrastructure accessed through a diversity of appropriate tools is again at odds with that of a single centralised platform.

Such diversity will result in an ecology of different product 'life forms'. How will they evolve and what are the symbiotic or parasitic relationships? With such complexity, emergence and evolution are appropriate expressions, and indeed diversity is a more robust approach than accurate prediction. What is exciting is that legislation,



Muji CD player, designed by Naoto Fukasawa at IDEO. This simple product achieves inclusiveness through restraint.

demographics and changing attitudes will make inclusion an increasing part of the 'climate' and therefore influence the results for the good.

### Lightness of touch

After many words, I should end with what to me is an example of the inspiring design I have been writing about.

The CD player, designed by Naoto Fukasawa at IDEO and manufactured by Muji, mimics a wall-mounted fan as it spins its exposed compact disc. The cable and pull invites an easy tug to set the music in motion, and the single speaker is built into the case itself.

This is a simple product and in many ways an inclusive one. It was designed to be intuitive (to be used 'without thought' in the designer's own words), tapping into deep cultural conventions and so is certainly accessible in a cognitive sense. There is no visual display, which makes it accessible in other ways too (but certainly not universally so).

This inclusion is achieved through its restraint, not its comprehensiveness, however, which may be a controversial statement. Such restraint precludes this product being 'all things to all people', and so implies a diversity of solutions for different people and their different needs.

As part of a diversity of approaches it would be good to see the best of inclusive design aspiring to such lightness of touch.

*The author is an interaction designer at innovation and design consultants IDEO, but this is a personal point of view: At IDEO we are united by a shared approach of user-centred design, but enriched by a culture which encourages a diversity of opinions.*

### Acknowledgements

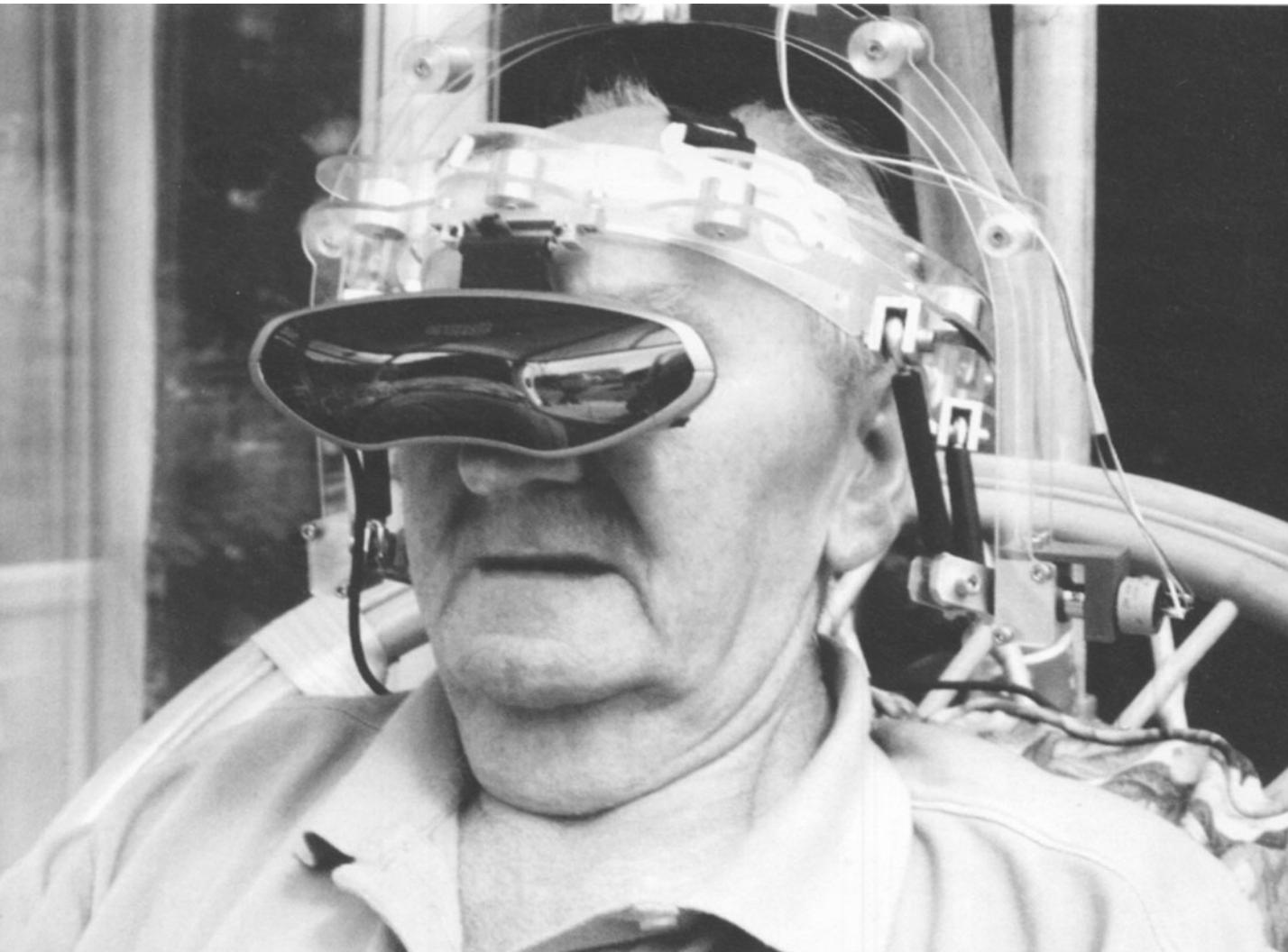
Images: chapter title page and this page, Muji CD player by Naoto Fukasawa, photo courtesy IDEO; Charles and Ray Eames furniture, photo courtesy VITRA; James Leckey furniture, photo courtesy LECKEY; experimental phone, photo IDEO.

## Chapter 33

# The future for ICT

**Alan Newell**

University of Dundee

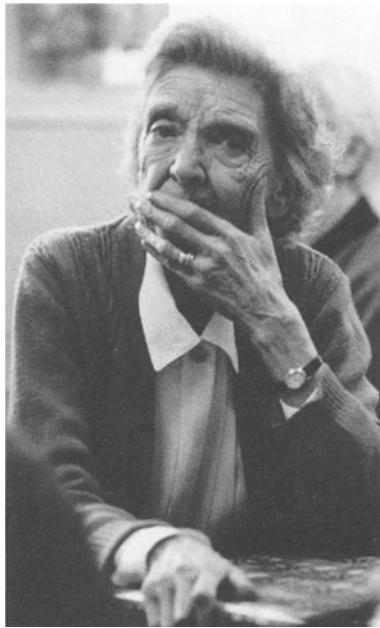


The author examines trends in the marketplace for communication and information technology. These will be caused by increasing numbers of older and disabled people, the baby boomer generation, disability legislation, and the increasing importance of markets in the developing world. He describes the concept of 'ordinary and extra-ordinary human computer interaction', and recommends the techniques of 'user sensitive inclusive design', and 'design for dynamic diversity' to assist in the development of truly inclusive products in this field.

Predicting the future is a dangerous game, the world being full of examples of statements which though reasonable at the time, later become absurd. These include Alexander Graham Bell's prediction that in the future there might be a telephone in each city. A danger with predicting technology is a focus on the technology rather than on people who will use it. It is unlikely that medical science, or policies of euthanasia, will enable people to remain at the peak of their physical fitness from their mid-thirties till the day they die, nor that eugenics, abortion and medicine, will produce an entirely able-bodied population. Therefore, there will be an ever-increasing numbers of people with reduced functionality. Statistics from the USA indicate that more than half of people over 65 years old have a major disability, and a recent UK Royal Commission estimated the cost of long-term formal care for older people could rise from £11.1 billion (1.6% of GDP) in 1995 to £19.9 billion in 2021 (1.6% of GDP), and £45.3 billion in 2051 (1.9% of GDP).

An interesting aspect of the ageing population is the effect of the social attitudes of the 'baby boomer' generation, who are more likely to be 'living solo' by the age of 75. They are likely to want to continue to use Information Technology to support their social and communication needs; they have been used to getting what they want, and to be in the van of fashion. As these demographic trends take hold, there will be a change in the marketplace. No longer will the young be the only focus of design, but older people will require that their needs are satisfied by communication and information technology, and will not buy systems they find hard to use. Thus designers need to consider the needs of both

- fit older people, with multiple minor impairments, and
- frail older with major disabilities



A 'typical' user of communication and information technology.

Younger people will need to become more economically active. Thus information and communication technology will have to be designed for a wider range of young people. A particular instance of this is systems for those with reading difficulties, such as dyslexia, illiteracy, and illiteracy in English. These currently affect a significant percentage of the population of the UK, particularly those who are unemployed.

The other human-based change will be the rising importance of the developing world as a market for communications and information technology. The vast majority of potential users in the developing world are unfamiliar with technology, and have vastly differing needs and wants to those of the average user in the developed world. Many users in the developing world, however, are as different from the 'average' user of technology as an 85-year-old frail old lady in the developed world (Just as very few old people in the developed world have access to computers, over 50% of the population of the world have never used a telephone). But these are a major market, and parts of the developing world are leapfrogging over the years the developed world spent using landlines and going directly to mobile technology. To be truly successful within the developing world, however, communications and information technology must be designed to be appropriate to the needs and wants of the people, and their environment. Therefore the same user-centred techniques need to be adopted to provide people in the developing world with appropriate IT resources. This will ensure that communications and information technology is designed to be appropriate to the needs and wants of people within the developing world, as well as the developed world.

### Design inclusively or look for another job

Thus two further categories of user are

- those who are illiterate, including those with little written culture,
- and those in the developing world who have no experience of technology and who live in a non-technological environment.

All these predictions are moving away from the 'typical' users of technology – the young male user who is obsessed by technology and likes playing with it. These new user groups are much more like the 'laggards' in 'marketing speak' rather than the 'innovators' and 'early adopters'. Information and communication technology has been particularly bad at designing for these 'laggards' – who might more

accurately be called 'those who will not put up with technology that is not designed with their needs and wants in mind'. Where does this leave the future of a designer of communications and information technology? This might be stated crudely as:

"design inclusively or look for another job"

and from a corporate perspective:

"employ inclusive designers or your company will lose market share and implode."

From a Design Community point of view we should be considering how design behaviour and methodology will have to change. The major changes which designers have to tackle if they are to include older and disabled people in their potential user groups include:

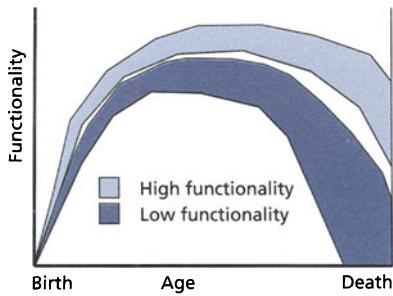
- a much greater diversity in the user groups for products, and greater challenges in finding representative users,
- different user groups may provide very conflicting requirements for a product, and conflicts between accessibility, and ease of use for less disabled people 'temporary able-bodied' e.g. floor texture can assist blind people but may cause problems for wheel chair users, and provides difficulties for able bodied people with rolling luggage,
- some users with disabilities will have very specialised and little known requirements, and
- difficulties in communicating with potential users, and greater ethical constraints in the design process. Deafness and memory loss can cause problems, it may be difficult to get informed consent, and some may be 'incompetent' in a legal sense.

Thus the traditional user-centred design methods are no longer adequate. The idea that the average functionality of the user group for a product can be easily defined, and that experiments can be conducted with five users as a representative sample are no longer tenable.

Designers will also have to examine new ways of gathering data from users. These considerations led researchers at Dundee University to coin the phase 'User Sensitive Inclusive Design' which seeks to address these issues. (Newell and Gregor, 2000 and 2002).



Expert and non-expert users of communication and information technology.



Increasing diversity of functionality and rate of change of functionality both within individuals and between individuals.

In addition, the cognitive, physical and sensory functions of mature people decline at different rates for each individual, and this pattern varies widely between individuals. As people grow older, this variability and rate of change can increase. An individual's capabilities also vary in the short term due to a variety of causes including illness, blood sugar levels and state of arousal. This presents a fundamental problem for the designers of communication and information technology systems. Many designers have assumed that their typical user is a young, fit, male whose abilities remain static over time. This view does not take account of the wide diversity of abilities among traditional users, and ignores the fact that, for all users, abilities change over time. User-centred paradigm typically examines concerns such as representative user groups, without regard for the fact that the user is not a static entity. Designing for a moving target is a fundamentally different design practice, and this has led to the concept of Design for Dynamic Diversity (Gregor and Newell, 2001).

Legislation will force manufacturers to produce systems that are accessible to people with disabilities. This will be reflected in attitudinal shifts in customers' preferences. We have already seen major shifts in customers' preferences. For example, in the 70s and 80s, few customers were interested in car safety, but a growing realisation that a safe car could be manufactured, together with new safety legislation, changed the market substantially. Some manufacturers now lead their advertising with safety features. The Ford Motor Company designed the 'Focus' to be usable by older people, by equipping their designers with suits which impeded their movements, but judged that the market is not yet ready to accept cars designed on this basis. This situation, however, is likely to change, as being 'old' is no longer something of which to be ashamed. Usability by everyone, fit or infirm, will become a major selling point for products.

### Computer Interfaces and systems in the future

Interfaces to computer systems have not changed radically over the past 30 years. Changes in society in the future, however, will lead to the need for truly inclusive interfaces which are dynamic, predictive, adaptive, configurable multi-modal interfaces, in which gaze, gesture and bio-signals are incorporated, and which are context and environment, location and hardware aware. These systems will need to

incorporate different interfaces for different people, and will include automatic learning to respond to the changing needs of individual users. This will affect interfaces to all computer systems – desk top, palm top, wearable, and apply to all environments in which computer systems may be used. As mobile telephones, personal organisers and other technology become fashion accessories for increasing numbers of affluent older people, their interfaces will need to be aesthetically pleasing and have the beauty of simplicity, whilst retaining their inclusive attributes. Thus we shall see substantial shifts in the market towards:

- a much greater focus by consumers on usability rather than functionality,
- a requirement for accessibility with dignity for those with major disabilities,
- a new aesthetic, and
- a new advertising focus.

The challenge for designers is to address the needs of ALL potential users from the start of the design process, rather than considering users with special needs as an add-on extra. There is now sufficient computer power to develop really powerful, but very simple, interfaces, and the need for extra functionality is not obvious for many applications (often the reverse is true, i.e. less functionality is needed by users than is provided by the manufacturer).

Once customers become aware that communication and information technology systems can be easy to use, everyone will want these characteristics. It could become socially unacceptable to have a system which is hard to use ("well with my new video recorder, I could set the clock and program it within it in a couple of minutes – you should get one as well"). Customers will see the advantages of buying a system which an able-bodied person can use just as easily after they have broken their wrist, in the dark (when they were 'blind'), in a noisy environment (when they were 'deaf'), when they are very tired or suffer temporary cognitive dysfunction due to imbibing noxious substances ('demented').

There are historical precedents for this. The cassette tape recorder was first developed by a company making talking books for the blind (and engineers said it would never be popular because of the poor



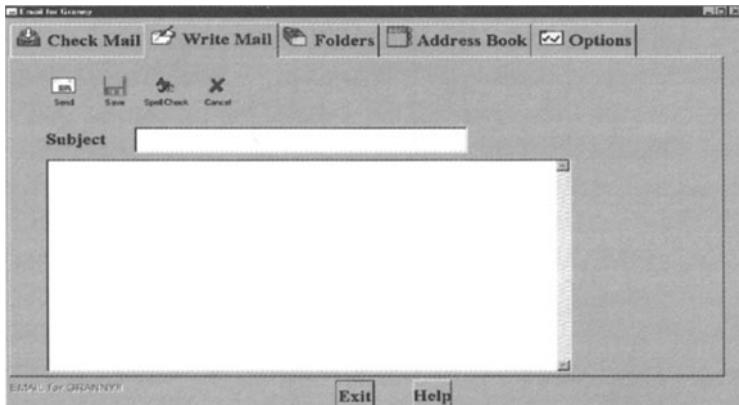
Design for older and disabled people and you could be designing for everybody.

sound quality). The predictive systems used in mobile telephones were first invented for disabled people who could not use a standard typewriter keyboard (Arnott and Javed, 1990). Interactive text messaging has been used by deaf people for over thirty years, but only recently been available within email systems. Text messaging has become incredibly popular even though the technology had not been designed specifically to support it. If designers had followed the rehabilitation literature, their mobile phones could have had properly designed text messaging systems from the beginning.

### Ordinary and extra-ordinary HCI

In his keynote address to InterCHI '93, the author (1993a) emphasised the importance of research and development in HCI taking into account the full diversity of the potential user population. He made the point that disabled people are not a stable homogenous group, and 'disabled people' are only a small part of the population of people with reduced functionality. He also commented that able-bodied people can be handicapped by their environment – an extreme example being the soldier on a battle field who is blinded by gun smoke, deafened by gun fire, mobility impaired because of being in deep sand and in a flack jacket, and cognitively impaired due to being under attack. These themes led to the concept of 'ordinary and extra-ordinary human-machine interaction' which draws a parallel between 'ordinary' people operating in an 'extraordinary' environment (for example, high work load, adverse noise or lighting conditions), and an 'extra-ordinary' (disabled) person operating in an ordinary environment (Newell, 1993b, 1995). It was commented that examining the extremes of human interface design, such as users with disabilities, will encourage better design methods and lead to better products for everyone.

The influence of inclusive design and ordinary and extra-ordinary human-machine interaction, will lead to products such as a simple word processor which does what customers want, and only what they want, and which is easy to see and to access all the functionality that is important to the user. A mobile phone which can be used in the outdoors on a winters evening without risking frost bite to the fingers, digital television which is as easy to use as analogue television, and Interactive television, and DVDs. which are as easy to switch on and use as a domestic cooker. And all these devices will be able to be used whilst



Simple systems can be designed.

holding a baby, or a glass of wine in one hand, without having to bother to put the light on, and whilst talking to your partner. Your aged mother, who is visiting will also be able to use them without difficulty.

Customers will no longer want to buy unusable and inaccessible products. The future will see inclusively designed communications and information technology products, and products where ease of use has been the primary design consideration. In the same way as many cars are now marketed primarily on the basis of their safety, so ease of use will become the primary marketing ploy. Designers who do not accept these changes will find their market segments decreasing. All customers will see great benefits from the inclusive design agenda – at last they will be able to buy communications and information technology which does what they want it to do, without them having to battle with human interfaces and dialogue systems in which the needs and functionality of the real users were never really considered important.

## Acknowledgements

Images: chapter title page, Tele-presence concept by James Auger  
RCA Design Products; older users, Fran Marais-Faulkes and Georgina Ravenscroft.

## Further reading

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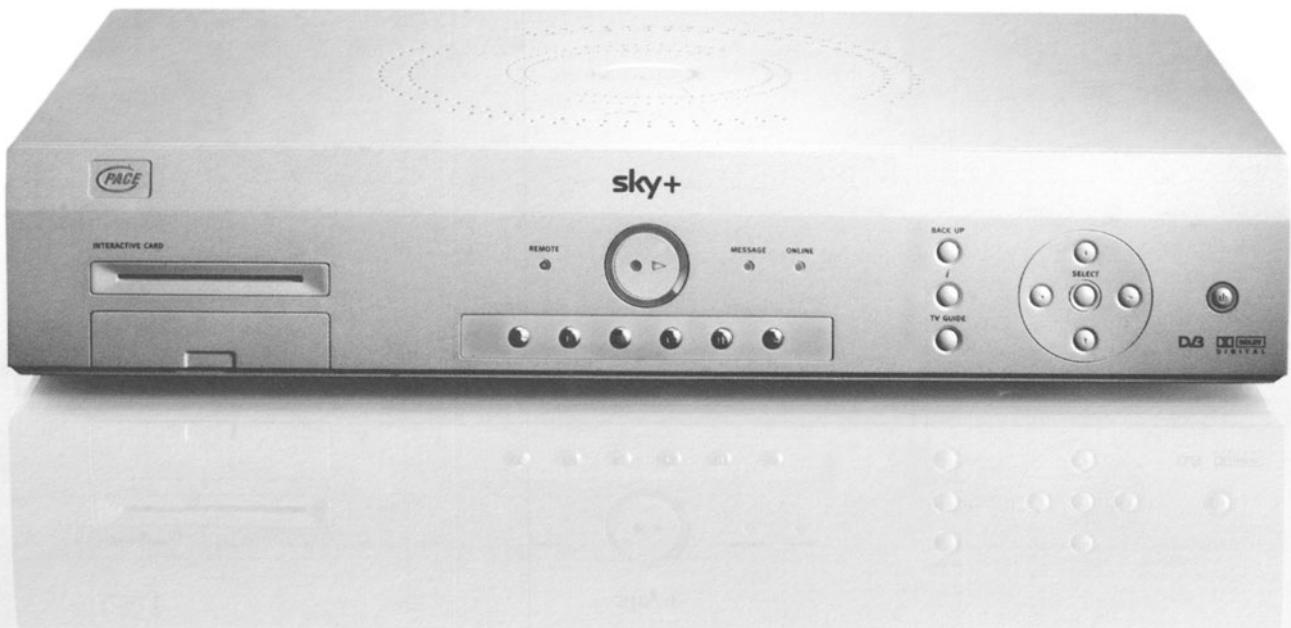
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## Chapter 34

# Design in a digital world

Mike Woods

Tangerine

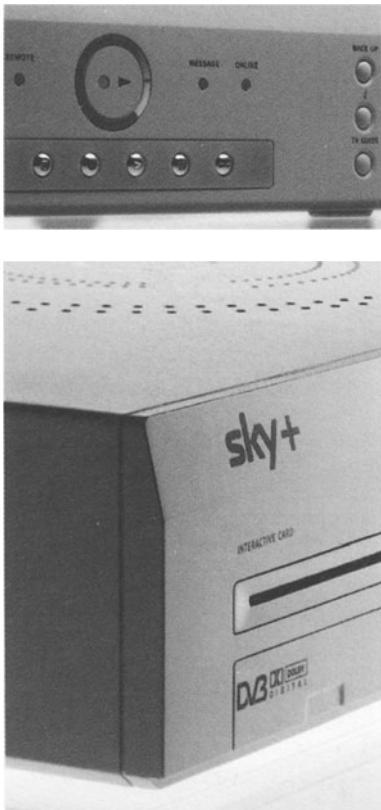


## **Levels of 'exclusion' or levels of 'engagement'**

The wonders promised by digital technology pervade many aspects of our professional and domestic lives. Of these technologies, those that deliver our communications, information and entertainment are becoming increasingly convergent. What were once bespoke services have the potential to be delivered in varied combinations through new and diverse channels and as we move further into the future once familiar identities are becoming blurred. As the manufacturers of these convergent technologies vie with one another to gain ownership of emerging territories they will be faced with a challenge, how to maximise 'inclusivity'.

Current research into users' differing levels of ability makes clear the case for an inclusive approach to design, revealing overt examples across a spectrum of degrees of exclusion. What is less immediately obvious is the number of people excluded by a lack of 'meaningful engagement'. This is about inclusion or exclusion in the broadest sense and will become fundamental to those companies trying to get us to take-up new technologies and services. Inclusive design, in this context, is a very mainstream activity. It is about discovering those qualities that make us as consumers willing to engage with a product or service, taking as a given that not all users have the same levels of physical and cognitive ability.

It is rarely in either a consumer's or a manufacturer's interests for everyone to be included by a single solution since it is unlikely that a 'one size fits all' approach delivers more than a uniform blandness that actually suits no-one. The principle of targeting specific markets with specific products or services is not new and as users confronted by a product or service we address a range of issues and react accordingly; we may be engaged and delighted, or merely willing to suffer what seems to be the best of a bad lot, or worse still, turned off completely to the point of downright rejection. This spectrum of reactions may at first seem extreme, but in a world apparently full of consumer choice all are common experiences and quite natural patterns of consumption. Though this would appear to be a user problem it is actually far more acute for the manufacturers whose products are under such subconscious scrutiny! If manufacturers are only partially 'including' their core target markets with known technologies and product types,



#### Sky+ design by Tangerine

Sky+ offers the most advanced premium digital service in the world. The PVR confirms the broadcaster as an innovative market leader and satisfies the sophisticated aspirational demands of its target audience.

how will they be able to predict whatever future attitudes may be required to support new or unfamiliar technologies and services?

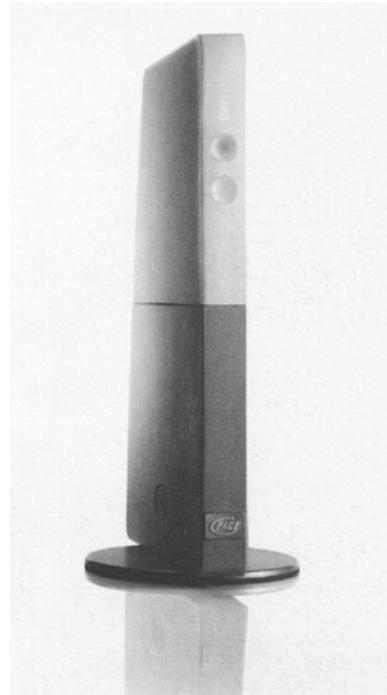
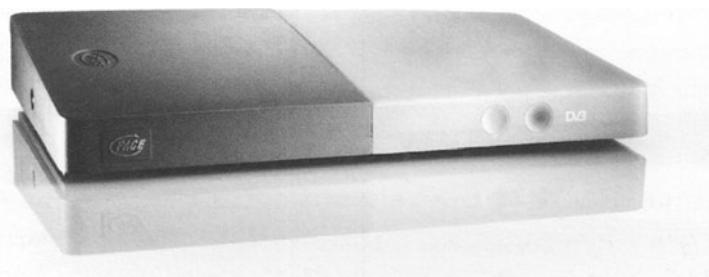
Apart from the obvious results of not maximising their sales potential in the short term, is it important to manufacturers or service providers if our needs are often at best only marginally 'included' by the products and services they offer? The answer is, that conversely, not only are our needs being marginally 'excluded' but so too are our aspirations. It is our needs and aspirations together, that combine to form our perceptions of a company's brand, its ethos and purpose. If products exclude those they are positively seeking to include it causes a gulf between a brand's intent and its perception by consumers. How many brand guardians understand the tangible reality of their brands as perceived through their products and does this reality fit with the message delivered through advertising and other communications media?

#### Meaningful engagement

Generally, the teams of people involved in the various stages of the new product development process are used to differentiating products by listing technical specifications (and other jargon), since the language required to express the less tangible values of products is not always immediately obvious. Yet gaining a deeper understanding of the less tangible values of a product can give a far deeper understanding of that product's potential to include or exclude. This level of inclusion is better expressed as the potential to form a meaningful engagement with a user's life, or, of course, disengagement from it.

Designers tend to think in these terms naturally and the potential to deliver meaningful engagement is predominantly an issue of design and design process, but to what extent are products actually designed by designers? New product development teams are generally formed from diverse specialities that may include product planning, product management, marketing, market research, future technology research, engineering (from a variety of disciplines), sales and design management, with designers being introduced to the mix once a brief has been prepared. The reality is that many of the most fundamental design decisions are actually made long before designers ever become involved. It is no coincidence that designers have become notorious for wanting to re-write the brief!

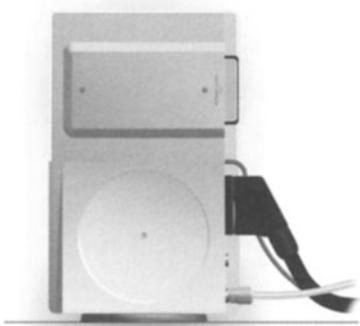
The greatest potential to prevent meaningful engagement with users occurs during the earliest stages of product planning and research. The fact that many organisations are unaware of the true level of engagement between their products and the customers those products are aimed at is perhaps because traditional market research is bad at quantifying even our strongest emotional reactions. Involving design-centred research early in the development process unlocks the user needs and aspirations that stimulate and inform meaningful product opportunities. It is considerably more efficient than investment in even the most streamlined of engineering development processes applied downstream to what may be fundamentally the wrong product.



### Unlocking user needs and aspirations

The products we engage with most are those that feel intuitively right, anticipating both our needs and aspirations. Whether we are aware of it or not, they can create positive and lasting bonds between us and a brand. Being in a position to capitalise on the long-term potential of such customer satisfaction is clearly of great value, nowhere more so than the world of rapidly changing digital technologies. However, earning the implicit trust of potential customers confronted with the unfamiliar can never be taken for granted and requires considerable clarity of purpose on the part of the manufacturer, as well as a desire to really understand the breadth of user perspectives. Design thinking and design-based research processes can show not only the broad diversity of users' current experiences but can imagine appropriate futures that unlock aspirations and provide vital insights into what is relevant. A design-based approach to research and planning enlightens the development of technologies that are of inherent value rather than merely new.

**Pace DTR500 design by Tangerine**  
Iconic vertical/horizontal formats and compactness challenge preconceptions of the traditional set top box to open new market possibilities.



DTR500 rear and cabling.

It is important to understand where the differences lie between the findings generated by a design-centred approach to research and more traditional market research processes. Perhaps the two most fundamental are the relevance and immediacy of findings to those who need to use them, the designers. The range of processes available is diverse and can be tailored to add considerable value with even the most constrained resources. Armed with an understanding of attitudes, aspirations, needs and above all context, design briefs can be formed more effectively. The whole design team in its broader sense (as described above) need to be in a position to work concurrently particularly in the arena of digital technology, where gaining credible ownership of new territories is so key to business success. Concepts generated from briefs informed by design-centred research will not only be more likely to engage with users but will more closely match the available business resources and brand aspirations of the manufacturer.

### Understanding the value of design thinking

Design thinking employed at the earliest stages of the new product development process can be a catalyst for inclusive product development. However, that this is often not fully understood or valued by manufacturers may be because its language and process are sensitive to those intangible qualities of product and service experiences that can be hard to quantify. Yet designers are comfortable combining methods that may be rooted by tangible fact with those informed by more emotional and intuitive reasoning.

It is accepted that designers have the ability to solve problems in a way that is sympathetic to a user's perspective. Generally their role focuses more on discovering the values of objects and experiences rather than the finite detail of technology, but what is critical is the ability to understand and predict the detail of how users will want to interface with technologies, whether in a physical or virtual sense and how to give clarity to the often complex relationships that operate between products and the services they deliver.

Design thinking relies heavily on an ability to build a constantly evolving awareness of the development of trends that include attitudes, lifestyles and aspirations and that range across diverse spectrums of users. When this informed intuition of broad contexts is supplemented

by specific research it is possible to accurately imagine appropriate futures that will engage in a meaningful way with users.

The involvement of design thinking in planning and research creates a very natural environment for designers to operate in. Of all the disciplines of the new product development process, design cannot exist in isolation. It cannot help but be informed by issues that cover planning, technology and engineering and is grounded by an acute sensitivity to both user environments and developments in retail.

### **Changes that will empower an inclusive approach**

The rewards available to manufacturers by taking an inclusive approach to the design of their products and services can be summarised succinctly: excluding people because you don't know how to include them, makes bad business sense. Especially if your internal development processes mean you don't even realise you're doing it!

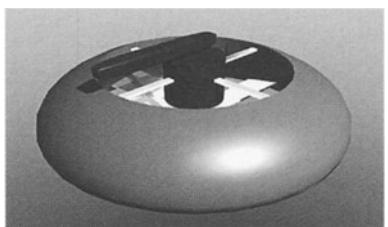
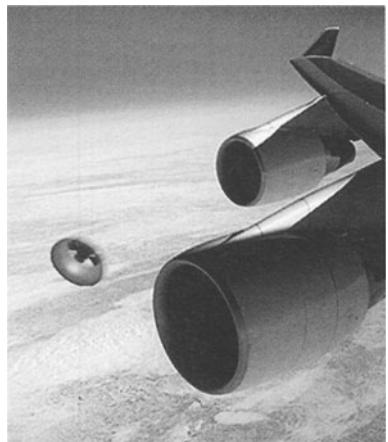
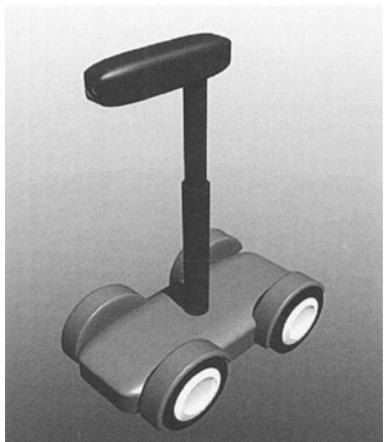
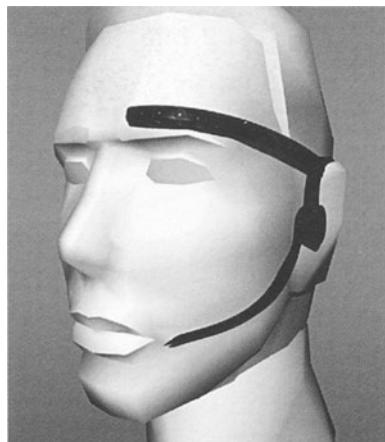
Changes in attitude may be required by some designers also, in order to be involved in a dialogue of investigation where design research and thinking informs the process of describing a design brief. Those responsible for selling the value of design may need to refocus on activities that are not centred around the use of time-compression engineering services and take a hard look at the methods they use to get products to be inherently right for users, rather than merely secure for manufacturers.

Ultimately, truly 'inclusive' design is a matter of understanding a complex mix of tangible and intangible values, in order to achieve the potential of business and brand aspirations. Practically, this comes down to the involvement of design thinking at a stage of the development process where it has a chance to be most effective.

# Chapter 35

## Remote interaction

**Stephen Wilcox and Eric Callahan**  
Design Science



Over the last few years, a number of technologies have converged to make possible a whole new approach to the world. We call this new approach 'remote interaction'. The idea of remote interaction is direct, real-time interaction between a person and a remote site. Of course, remote interaction has been possible for years – via ancient signaling techniques, using light or smoke, then carrier pigeons, then telegraphs, then telephones, and so on.

However, new technologies allow a type of remote interaction that is different in kind from anything that we have experienced before – a type of remote interaction that is profoundly compelling and that we predict will explode onto the product landscape in the very near future. This new type of remote interaction is made possible by real-time control of both remote perceptual mechanisms and of actuators that can alter the environment from a distance.

At present, we can watch a live feed from Venice, but we can't directly control that live feed. This differs from 'natural' visual perception. When we move our eyes, we see something different, as we do when we move our head, or walk around to the other side of an object, or go for a drive, for that matter. Thus, our behavioral systems, including assistive devices such as automobiles, are an integral part of our perceptual systems. Likewise, when we're watching a travel show about Venice, we can't change anything in Venice. We can't pick up a piece of trash or buy a new hat.

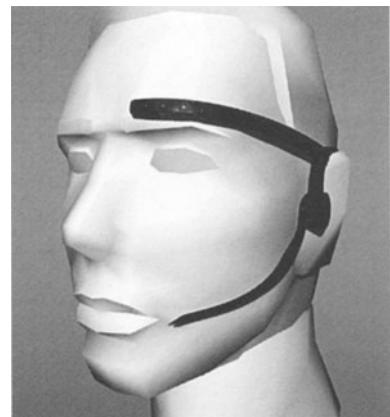
What if we could? In other words, what if we could go to a work station at home and explore Venice as well as act on Venice?

We have two things to say about this:

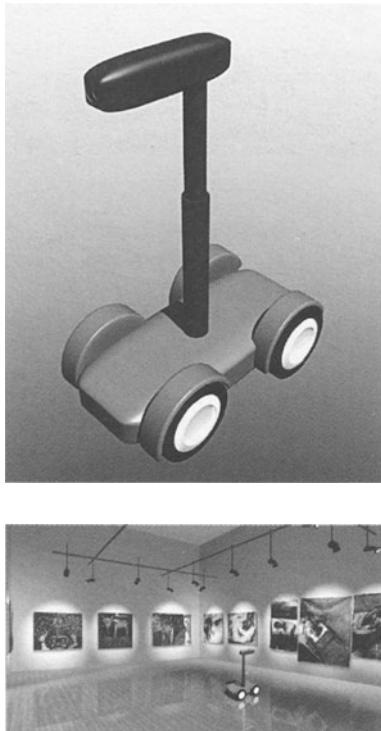
- it will happen soon, and
- when it does happen, it will prove particularly valuable to those with severe disabilities, such as quadriplegia.

## It will happen

In fact, remote interaction is already happening, particularly in the military and security fields. Some examples include unmanned aerial vehicles (UAVs) that were initially deployed in the mid 80s by the US military. These have progressed from surveillance-only devices like the Pioneer and the Hunter, to surveillance-plus weapons systems like the latest version of the Predator and the new Global Hawk. These systems, flown from a pilot station on the ground, are getting closer



Generation 1, audio headset used in remote travelling.



Generation 2, remote controlled device visiting a gallery.

to feasibility as consumer products. For example, the Vector, a small remotely controlled conventional aircraft manufactured by Applied Systems Engineering, costs less than \$5,000, and a surveillance drone developed by Georgia Tech – a ducted-fan-driven device that is controlled from a hand-held controller. Another example is the mobile detection assessment and response system (MDARS) developed by the U.S. military. This is a wheeled robot designed for remote examination of buildings.

There are many other devices that have emerged for specialised applications, some that are terrestrial, others that are aerial. We think this technology will migrate from the military to consumer products very soon, just as many other technologies have done, from microwave ovens to global positioning devices. Here's a vision of where it might lead.

### Our vision

The first generation will begin as a wearable video-camera device with an audio headset. It will allow a person in a remote location to direct the camera by telling the wearer what he or she wants to see. It will allow homebound people to 'join' their loved ones on trips to museums, zoos, or to Europe, and it will be used as a research tool, where a senior researcher stays in the office and directs junior researchers in the field. It will also be used by sales people. For example, the prospective homebuyer will remotely examine a house via the broker wearing this device. Another application will be the performance of complex tasks (surgery, defusing bombs?) by relatively unskilled workers who are guided through the procedure by an expert.

The second generation will be a remotely controlled, wheeled device (with a controllable video camera) that allows people to go to museums, etc., on their own. These devices will allow exploration of harsh and/or remote environments, and there will be an underwater version that allows remote scuba diving. However, these remote interaction devices will cause various problems. The devices will crowd sidewalks and cause auto accidents. They will allow people to sneak into museums without paying. These problems will require the development of an infrastructure – 'drone lanes' or 'drone tracks'. Opposition from museums and other institutions will gradually melt away as various

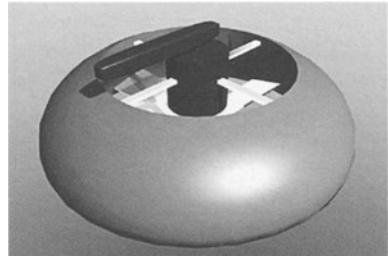
entities recognise that there's a new revenue stream to be had. They will build special systems to get the drones into their institutions for a fee.

The third generation will be an aerial device that makes the generation-2 infrastructure obsolete. It will await technological developments that will allow relatively quiet and nonpolluting devices to fly around our cities. There will be rental agencies for the devices, so you won't have to fly your device to Venice in order to 'go' there, and they will become increasingly personalised as their capabilities for communication and action improve. People will meet via their respective drones, and there will be 'singles bars' designed for remote networking.

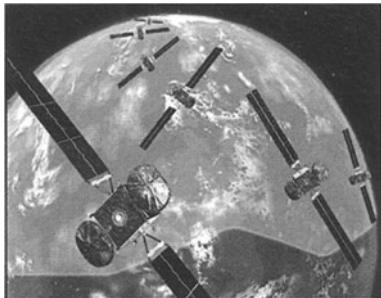
The devices will be used for viewing spectator sports, traffic control, and shopping, among other things. They will create privacy problems and aerial congestion problems that will have to be solved. There will also be opposition from trades unions (if any are left at this point in the future) because these devices will make jobs obsolete, from issuing traffic tickets to reading water meters. Also, as the presentation technology gets better (e.g. wrap-around video and sound), people will suffer from air sickness. Occasionally, these devices will cause accidents when they are sucked into aircraft engines or crash through auto windshields.

Finally, in the fourth generation, a new infrastructure will emerge that will replace hardware with software. A series of stationary and moving devices will be installed that create a 3-dimensional structure of the earth. There will be 'eyes' in the sky, on the ground, and in space and software to knit the individual images together into one giant structure. It will be possible to 'fly' (at any speed and altitude) through this real-time video version of the earth by means of specialised software. At the same time, virtual worlds will be created that deviate from the real world to varying degrees, so people will be able to interact with the real world or the world as altered by themselves or others who specialise in creating these worlds. The presentation systems will become so compelling (adding other senses, such as smell) that the distinction between 'real' perception and remote perception will blur.

Where we will all be at this point is anybody's guess. We expect there to be whole new categories of crime and whole new occupations. Also, we expect there to be all sorts of new ways to get exercise while we are all traveling through space. Either that, or people will become



Generation 3, drone could be sucked into aircraft engine.



Generation 4, infrastructure and workstation/playstation.

even more slug-like than we are now, and we will increasingly live in this semi-virtual world instead of the real one, forsaking our bodies, which will matter to us less and less. More than likely, both of these trends will take place simultaneously.

### What this has to do with inclusive design

So what does this all have to do with inclusive design? What we find very interesting about remote interaction is that quadriplegia, to use the extreme case (upon which we will focus for purposes of this discussion), is not much of a handicap. The person with quadriplegia will simply have to rely upon specialised control devices, such as neural interface devices, head-pointing systems, eye-gaze-based input devices, voice recognition devices, or the like. Other than that, remote interaction will work the same as it will for anyone else. The quadriplegic person will use the same system as everyone else to take a remote trip to the zoo or to go remotely scuba diving. In fact, devices that today are specialised for people who suffer from paralysis may well become the control devices of choice for everyone.

One analogy that comes to mind is the fashion of the powdered wig in 18th Century Europe. One way to think about it is as an erasure of the natural distinction between the elderly and everyone else. The majority of men (yes, only of a certain class, but that's beside the point) adopted a fashion that mimicked the appearance of the elderly, perhaps as a show of respect for age.

Remote interaction will evolve for other reasons, but it will have the remarkable benefit that it represents a gradual elimination of a fit body as a requirement for full and robust interaction with the world. In a sense, we will all adopt a quadriplegic life style. Yes, those who are not quadriplegic will be able to do other things as well, but those who do suffer from quadriplegia will not be as left out as they are now. In other words, if we distinguish between those tasks that a quadriplegic can perform ( $Q+$  for short) and those that he or she cannot perform ( $Q-$ ), today's world contains a strong bias toward the latter. However, as remote interaction gets more and more embedded into our way of life, more and more of what we do will be shifted from the  $Q-$  category to the  $Q+$  category. Of course, this shift to  $Q+$  is a trend that has been going on for some time now. Watching television is a  $Q+$  activity, as is, increasingly, using a computer, as new assistive devices get better.

However, the Q+ world is not as active as it will be. Watching television is passive. Exploring Venice is active. Exploring Venice is now either in what we might call the 'difficult' Q+ category or the Q- category. As remote interaction comes on-line, there will be nothing unusual about a person with quadriplegia exploring Venice. He or she will explore Venice in the same way as will people without quadriplegia.

Of course, there will be another way to explore Venice – by physically going there, and the technology to make that possible will also improve. And we are certainly not advocating that we shouldn't vigourously pursue the assistive technologies necessary to allow a person with quadriplegia to explore Venice in the conventional sense. We believe, though, that remote interaction will naturally change the world in the Q+ direction.

We have focused on quadriplegia to make the point. What we really mean, however, is that remote interaction will cause a natural convergence toward inclusive design in general. In a remote-interaction world, the types of disabilities that people have will be less and less limiting. Today we are making great strides in moving Mohammed to the Mountain. We should continue in this direction, bu at the same time, we believe there is now a natural movement of the Mountain toward Mohammed and we expect this trend to take off. oon.

The technology is all in place. Some far-thinking manufacturer just has to pick up the ball and run with it.

## Acknowledgements

All images courtesy Design Science

## Chapter 36

# Setting a standard

**Roger Coleman**  
Royal College of Art



## **But is it on the brief?**

So, where next for professional practice and design process? Many clues have been given in body of this book: designers Nina Warburton, Graham Pullin and Mike Woods have described how their own companies are innovating around the idea of inclusivity, how they are developing new methods and practice, and how the culture of their organisations is changing as a result. But, as Martin Bontoft and Graham Pullin point out in chapter 12, ‘Connecting business, inclusion and design’, although user-centred design innovation is at the heart of IDEO’s approach and philosophy, “it is rare that inclusion is explicitly on the brief at the outset of a project.”

Without that requirement coming from the client, no matter how committed or capable the design team is, it can only seek to influence the direction of the project either through stealth, or by educating their client in the process. That can be a plus for the design consultancy, especially if an awareness of issues such as current and upcoming legislation helps secure the brief in the first place, but in the longer term it can be disheartening if the will is not there on the client side. Also, it will be hard to deliver on the optimistic vision that has been sketched out in the other chapters in this section of future views, if designers do not get a real chance to hone their skills on explicitly inclusive projects.

Some businesses are beginning to see the value in an inclusive approach, as is demonstrated by the chapters from Raymond Turner, discussing BAA’s thinking in planning the fifth terminal at Heathrow, and from Joanne Coy, setting out how Consignia is recognising the importance and value of inclusivity in business strategy. Home improvement retailer B&Q has operated a ‘diversity’ programme over several years, through which it has sought to make itself an exemplary employer and attractive to older and disabled customers. The next step for B&Q has been to seek to add value to its products through good, inclusive design, and the company has embarked on this in a collaboration with the Helen Hamlyn Research Centre at the Royal College of Art. Other companies, like Fiat, despite its recent financial problems, have found value in developing consumer offers that include older and disabled people, and treat them like any other customer.

## Why isn't industry on board?

Individual success stories can help to define good practice, but are not in themselves enough to ensure that inclusive design makes the transition to good design that so many of the contributors to this book would like to see. As the earlier sections point out, older and disabled people now expect to be part of the mainstream. As consumers they should pull enough weight to guarantee that their aspirations are met, but still there is a lack of an appropriate response from business and industry. Inclusion just isn't high enough on the agenda.

Julia Cassim and Hua Dong's chapter on 'Critical users in design innovation' demonstrates that an inclusive approach to design, especially where carefully selected users become part of the process, can become a dramatic spur to innovation, and result in design of the highest quality. Inclusive design can be good design, and good design should be the better for it. But, as Adrian Caddy, director of leading design company Imagination, put it: "I have probably seen hundreds of briefs for different projects. In my experience, I have to tell you, designing solutions to be as inclusive as possible has never been a primary, secondary or even tertiary requirement of any."

Herein lies one of the major obstacles to inclusive design practice: designers are simply not asked to consider such issues. Given the consumer push described in the early part of this book, it is hard to see why the commercial sector has been slow to respond. Public buildings and spaces are changing radically in terms of accessibility, so why is the same change not happening in the world of products and services. I believe the main reason is that legislation has already had a significant impact on the built environment, local planners and building managers have had time to understand how to deliver inclusivity, and a body of best practice is building up, some of which features in the section on the global picture. The same cannot be said for other sectors of design.

## Sticks and carrots

However, as Catherine Casserley and Marcus Ormerod point out in chapter 8 'The legal argument for inclusive design' legislation is a powerful driver of change, and the full impact of recent legislation in the UK and other countries is yet to be felt. In particular, the anti-discrimination legislation that now exists, for example, in North

America, Ireland, the UK, and Australia, gives individuals the right to sue companies and organisations that discriminate against them. In the UK this does not apply directly to the manufacture and design of products, but it does apply to those who supply goods and services to the public.

This liability can only be countered by the argument that a company has taken 'reasonable steps' not to discriminate. But, as Casserley and Ormerod point out, the obligation or legal duty not to discriminate is an evolving one "what is not reasonable today, may ... be reasonable tomorrow." The best protection, they argue, is to opt for an inclusive approach as the best defence against future liability. At least that way it will be possible to establish that reasonable steps have been taken under the circumstances.

All this points in the direction of inclusivity becoming a necessary aspect of good design. To not address the issue will be to leave oneself open to litigation. But if this is the case, and we can expect to see inclusivity moving onto the brief in an explicit way as an insurance against future liability, what will constitute sufficient or reasonable steps?

## Setting standards

In anticipation of these developments, and to supplement current and future legislation, the British Standards Institution recently decided to add a further BS to the 7000 series on design management. This is a very positive move, because, rather than set a prescriptive standard in terms of say the usability of products and interfaces, which is likely to fall into the trap described by Selwyn Goldsmith and discussed in the introductory chapter 'From margins to mainstream' where standards meant to establish the minimum acceptable level of provision become, in practice, the maximum that is ever delivered.

Also, in an era of rapidly changing technology, such standards are unlikely to hold up for long, given the sorts of innovations discussed by many of the authors in this book, especially Alastair Macdonald (chapter 11, Humanising technology). A process-based standard in design management, on the other hand, is unlikely to date rapidly, as under such a standard, practice can evolve in just the same way that expectations and legal interpretations of 'reasonable effort' will evolve.

In addition, as inclusivity becomes part of business practice, it will also become something on which companies can compete, and so will be incorporated into business strategy. Since the standard will talk about cultural change within organisations the likelihood of it leading to significant shifts in business practice is high. If that happens, then some of the case studies discussed in this book will set early exemplars that others will follow.

In this way there is a real possibility that a level playing field can be created on which companies can compete around the inclusivity of their consumer offer. I say level playing field, because if a practice-based standard is established then those organisations that work to it will feel secure against legal challenge rather than further exposed if things go wrong. Given this confidence, business and industry will find it easier to engage with the inclusive agenda, and compete to deliver on it.

### What will the standard require

A number of contributors to this book are currently working on the standard, and the next section is intended to give a brief preview of some key elements. In the case of inclusive design, the intention is not that it should be seen as a specialist genre of design, but an aspect of good practice – an integral part of good design – and an aspect of sound business decision-making. In other words, the emphasis will be on the management of design as part of business practice, and the incorporation of inclusive thinking into business management and hence strategy. At the heart of such a management standard there has to be a process through which the goal of the standard is achieved, and this is likely to be described as a change process for all aspects of the business, not just design.

Through such a process, the business will seek to audit its current performance, identify its short-comings and develop the necessary understanding to rectify them. This will lead to measurable improvements in its consumer offer, and allow it to identify scope for further improvements through innovation. This is not a single process, but an iterative cycle, and this is the strength of such an approach. It offers companies a way to engage with inclusivity that is aspirational, and so fits other business models that focus on innovation and evolution rather than on success or failure against absolute measures. As

such it also offers a real security against future liability and litigation, as the process will generate its own audit trail. Further, it will stimulate competition, as an important measure of success will be improved profitability through an enhanced customer offer.

### Audit, understand, improve, innovate

By moving through these stages, manufacturers, retailers, service providers, communications companies, voluntary bodies, and so on, can all begin to recognise how and where their current practices and consumer offers are deficient. They will also be in a position to respond rapidly by taking steps to rectify the deficiencies, and then to adjust their business plans (and cultures) in such a way as to benefit from changing market conditions and exploit opportunities to innovate.

The success of such an endeavour will depend on the organisation engaging with it at all levels, with the key groups including:

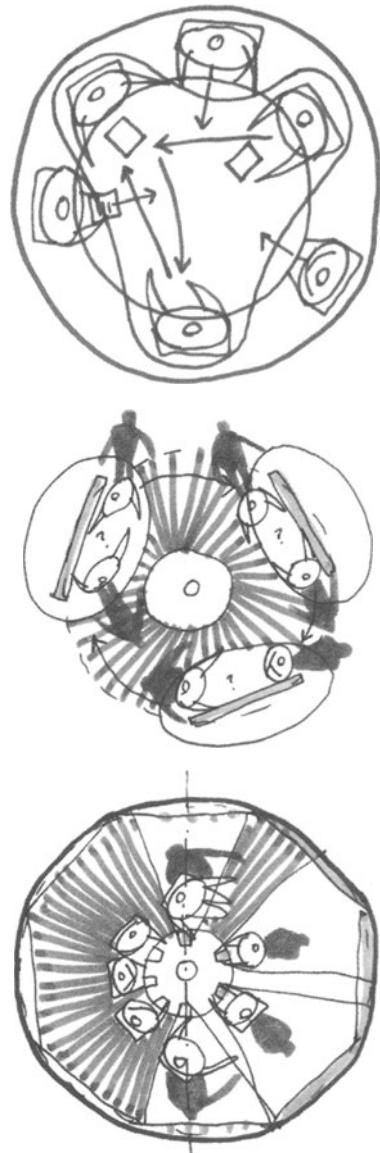
- directors and senior management,
- design managers,
- those responsible for innovation and new product development,
- marketing and branding executives,
- and the team of designers working on any project.

There will also be implications for purchasing and sales personnel, as their decisions and behaviour directly effect the public perception of a company and its products and services.

At the senior management level there will be a need to develop an interpretation of key issues that fits and promotes the company's mission and goals. Or, if the company is not adequately oriented in its business goals, there will be a need to champion the issues within the company and push for the necessary shift in culture and business practices. There will be a further need to take on board the process – audit, understand, improve, innovate – and put the necessary systems in place to follow it through successfully.

### From theory to practice

To set the process in motion, clear authority should be delegated to a senior manager to head up a small, cross-organisation 'change team' that will research the background of demographic change and shifting



Places please: studies and concepts for a temporary environment to enhance team working. Greg Epps, Helen Hamlyn Research Associate project in partnership with IDEO and Steelcase, 2002/3

consumer expectations, and report back on the implications, both short and long-term for the organisation.

Establishing a change team will be key to success, and the task of that team will be to: audit the company's consumer offer and understand the relevant issues by bringing in experts (and expert users) to work with company personnel. It will also be to raise the level of understanding and engagement within the company, and transfer the necessary skills to support a group of internal 'champions'. There will be a further need to understand the nature and extent of prejudice or resistance within the company, and map that against existing and likely legislation, standards and guidelines and their impact on the company.

The overall goal of the process should be to initiate cultural change by giving the change teams sufficient authority and influence to ensure that all employees recognise and understand the issues and their importance to the future success of the company. This will also require the putting in place of training programmes and ensuring that new employee induction pays adequate attention to the key issues and relevance to business goals.

There will be a need to put longer term strategic planning in place to reflect the context of major market shifts – less young people, more older people, current and future opportunities for growth and competitive advantage, etc. And to identify new opportunities by involving employees and disabled and older customers in a proactive search for improvement in the quality of the company's consumer offer.

## Summary

This is only a beginning, but it does describe the likely thrust of the standard, which will propose the adoption of some such process leading to cultural change within organisations. The implications will be spelled out for groups other than senior decision-makers, in particular for design managers and design teams, and will reflect much of what has been covered in this book, but in ways that allow it to become part of good business and design practice.

If all goes to plan, the standard should be in place in late 2003 or early 2004, and from then on we should see a significant increase in demand for inclusive thinking and innovation expressed through design briefs. At which point the design community, which has invested much time and effort in developing thinking and practice in inclusive design,

will see some payback for the new skills it has acquired. From then on, the future of inclusive design will be in the hands, or rather the pocket of the consumer. If the consumer responds then we will see exciting developments in design practice and thinking as this highly innovative community rises to the challenge of delivering an inclusive future.

## Acknowledgements

Images: chapter title page, teamwork in design practice, brainstorming at IDEO, image courtesy IDEO; studies and proposals for a temporary environment to enhance team working by Greg Epps, Helen Hamlyn Research Associate 2002/3 and RCA Architecture and Interiors graduate 2001.



# Glossary, keywords and authors

# Glossary of terms

This glossary begins with the broader issues, and then moves on to design responses and methodologies. The intention is to provide the reader with an introduction to key terms and developments and an overview of the subject area of the book.

## Civil rights

Disability activists increasingly see access and participation as basic human rights (Article 37 on the right to participation in cultural life of community, etc.), which can only be guaranteed by effective and enforceable legislation.

Especially important in the US, where civil rights are enshrined in the constitution and the first major piece of disability discrimination legislation the Americans with Disabilities Act (ADA) came into force in 1990.

## Social inclusion

A Europe-wide political objective, aimed at combating social discrimination, marginalisation and conflict due to age, disability, poverty or ethnicity. Particularly important in respect of the diversity of immigrant populations in the EU and aspirations to expand the EU to embrace the whole of continental Europe, with a base population of c800 million.

## Medical model

The medical model of disability and ageing implies that people are disabled as a consequence of their own condition, and seeks to either remedy or correct the impairment through medication, rehabilitation and surgery etc., or offers adaptive aids and equipment as a physical remedy.

## Social model

In contrast, the social model, which has come to supersede the medical model, sees people as disabled or enabled by the social context in which they function and proposes that changes in the social context or environment can remove or alleviate disability.

## Original WHO model

The international standard or WHO model of disability was first published by the World Health Organisation in 1980. This described a cascade of effects beginning with impaired capability (loss of structure or function), which leads to disability (loss of skills or capabilities) and consequently to handicap (loss of social function). This shifted the emphasis from the medical condition to environmental and social factors that give rise to disability.

## New WHO model

In November 2001, after a seven-year investigation, the original model was replaced with a new International Classification of Functioning, Disability and Health (ICF). This shifts the focus from a person's medical condition to how they live with their 'health conditions' and how these can be improved or ameliorated to achieve a productive fulfilling life. In other words the focus is on how we function in social and other contexts, rather than on medical conditions per se, and therefore importantly on the interaction between health conditions, environmental factors and personal factors, and how these impact on bodily functions and structures, and consequently on activity and participation. Using the ICF framework, the WHO estimates that as much as 500 million healthy life years are lost annually due to disability associated with health conditions, more than 50% of the years lost due to premature death.

## Health condition

A term used by the WHO as a way of grouping disease, disability and other factors previously dealt with in more strictly medical terms, in a way that allows them to be seen as falling within a continuum of

health conditions, any of which can impact on our lives and aspirations. Health conditions can be temporary, chronic or progressive in nature e.g. hay fever is a chronic albeit temporary health condition, Multiple Sclerosis is a progressive condition that can result in significant disability.

### **Impairment**

Health conditions, congenital conditions, the ageing process and traumatic events can all result in impaired capability. Whether or not this impaired capability gives rise to disability is significantly determined by social and environmental factors, and importantly on the design of environments, products, systems and services.

### **Disability**

In the past, people were seen as disabled by their condition, whereas the current move is towards understanding disability as the result of a mismatch between individuals and their social and physical environment. Some congenital conditions and traumatic events lead to considerable impairment and so to high levels of potential disability. In the US the preferred term is 'people with disabilities', in

Europe 'disabled people' tends to be used.

### **Ageing**

The ageing process is characterised by the acquisition of progressive multiple minor impairments predominantly related to sight, hearing, dexterity, mobility and cognition. In combination these can lead to high levels of disability and dependency. Older people do not see themselves as disabled and are likely to be offended by the term.

### **Participation**

For disabled people, participation and social integration are the most important factors. Some severely disabled people would prefer the help of a personal assistant or carer where activities are difficult or time-consuming to perform. Self-realisation and social involvement are extremely important to younger disabled people. To them, being there and taking part are key.

### **Independence**

For older people the most important factor is independence, or the ability/possibility of living in their own home for as long as possible. Independence can be compromised by inappropriate design, and is also conditional on being able to carry out key and

instrumental activities of daily living (ADLs and IADLs) like bathing, dressing, cooking and also communicating with family and friends and participating in other aspects of communal life.

### **Design for disability**

There is a significant tradition of design for disability, mainly focused on aids and adaptations to everyday equipment and buildings. Related to the medical model), the underlying intent is essentially prosthetic, with origins in post trauma rehabilitation, particularly of war veterans. More recently, attitudes have shifted away towards inclusive design. E.g. the British Institute for Design and Disability, established some 10 years ago, recently renamed itself the UK Institute for Inclusive Design.

### **Rehabilitation design**

Closely related to the above, but with a primary focus on enabling social participation of people with severe impairments, e.g. Steven Hawking. Much work in this area has been concerned with developing one-off solutions and specialist equipment for small numbers of people. New and emerging technologies, like ICT and robotics, are making adaptive or customisable interfaces and intelligent assistants a real

possibility. No matter how inclusively we design in the future, there will always be a need for highly specialist customised solutions, making this an important field alongside inclusive design.

### **Barrier-free**

Original focus of disability campaigners and architects (e.g. Selwyn Goldsmith in UK, Ron Mace in US) was on barrier-free access to buildings and public environments. This led to adoption of kerb cuts and textured paving, ramped entry, wider doorways and corridors, and the wheelchair 'turning circle' in building design and adaptation.

### **Accessibility**

The focus was gradually extended to include sensory access to buildings and services and eventually to sensory and cognitive information – e.g. ATMs, internet sites – through speaking browsers, British Sign Language animations, the availability of documents like utility bills in Braille, and a range of other ability-friendly elements, now backed up by legal requirements under the ADA and DDA. The emphasis now is increasingly on the service provider, building manager, website owner, etc., to ensure

anyone can access their building or service. Universal Design specifically extends the concept to include access to products.

### **Universal access**

The term universal access (or access for all) is used in a similar way to Universal Design, but with an emphasis on information and communications technology (ICT). It is also used in the assistive technology field where it is specifically applied to the endeavour to develop, often at personal level, specialist interfaces for computers in particular, and other control devices that make ICT products and services accessible or usable by people with higher levels of impairment.

### **Universal design**

Concept originated in the USA and underpinned by seven principles set out by Architect and Designer Ron Mace. Taken up in enthusiastically in Japan. An extension of the idea of Barrier-Free Design and Universal Access, that proposes making the design of essential components of public and private environments universally accessible and useable.

### **Design for all**

European equivalent to Universal Design, with an emphasis on ICT.

Current EU goal is to encourage the establishment of national centres of excellence across Europe. These are envisaged as virtual rather than physical centres.

### **Transgenerational design**

Concept developed by James Pirl and colleagues at the University of Syracuse in the USA. Proposes that in an era of population ageing, designs should work for people of a wide range of ages and capabilities. Differs from Universal Design and Design for All in that it does not place the same emphasis on disability, but takes a market-led approach. Has resulted in a quality book on the subject, with excellent case studies, and also teaching material and extensive guidelines and guidance for practitioners and educationalists.

### **Gerontechnology**

Concept developed at Technical University of Eindhoven (TUE) in the Netherlands, along with US colleagues, mainly for Human Factors, Social Sciences, Gerontology and Engineering, and with Finnish colleagues from the National Research and Development Centre for Welfare and Health (STAKES). Emphasis is on the development of age-friendly technology and on deploying technology to address

are-related factors. Key focus is consumer pull as opposed to technology push, much work on Smart Housing and related subjects.

**User- age- disability-friendly**  
Implies that products, services, environments etc., have been designed with specific users in mind, and are managed in ways that welcome and support such users.

**User- human-centred**  
Terms applied to design approaches that place the user at the heart of the design process and often involve and engage with users in ways that make them part of and integral to the process itself.

**DesignAge**  
Royal College of Art action-research programme launched in 1991, and building on the 1986 'New Design for Old' exhibition in the V&A Boilerhouse galleries. These two initiatives brought 'the implications for design of ageing populations' to the attention of the international design and business communities and were funded by the Helen Hamlyn Foundation.

**Design for our future selves**  
Concept developed at the RCA, through the DesignAge

programme, as a way of encouraging young designers to engage with the challenge of designing for people other than themselves. Became the theme for many events at the RCA and of an annual competition open to all graduating students, resulting in many concept exemplars of age-friendly design. Has the advantage of making considerations of ageing a future-oriented activity and a driver for innovation.

**EQUAL (Extend Quality Life)**  
A cross research council objective identified by the DTI Technology Foresight programme as a key focus for R&D in the UK. Primary goal is to improve the life quality of older and disabled people by developing the necessary research base and technical expertise and transferring appropriate skills and technology to industry.

**i~design:**  
Collaborative research programme funded by the Engineering and Physical Sciences Research Council (EPSRC), under the EQUAL programme. Objective is to develop and disseminate design tools and guidance for design managers, to enable them to understand and appropriately

respond to the design implications of disability and population ageing to achieve a more inclusive society. Consortium members are: The Design for Ability Unit at Central St Martins, The London Institute; The Engineering Design Centre at the University of Cambridge; The Helen Hamlyn Research Centre at the Royal College of Art, London; and the Design Council.

### **Design exclusion**

Term (or approach) developed by the i~design team as a way to give substance to the idea of inclusive design, by focusing attention on those excluded by particular designs of products, services or environments. This has resulted in significant attempts to describe how this can happen, to provide case study examples of design exclusion and inclusive design practice, and to make it possible to quantify design exclusion with reference to population data.

The key point made is that some people will always be excluded by any specific design, and that such decisions should be taken knowingly and with justification.

### **User-aware**

Term used by the i~design team (in conjunction with the following terms) to refer to mainstream design that takes the needs (and

aspirations) of users into account, in ways that maximise the number of people who can use a product or service.

#### **Customisable**

The development of computer aided manufacture has made it possible to customise individual products at the production line and assembly level. Coupled with internet technology such as personal avatars carrying unique descriptions of individuals this capability offers the possibility of including a wide range of users within the overall specification of a product and delivering unique items matching individual requirements.

#### **Modular**

Designs which, by virtue of interchangeable units or elements can be configured to suit or fit different users, thus extending the range of users potentially served by a single design or product.

#### **Carer-assisted**

See participation above. If we are to deliver a truly inclusive mix of products, services and environments, it is important that people who are reliant on carers are also accommodated, and that implies considering both user and

carer and the two in combination. Here it is important to note that older people are often cared for by spouses and relatives, who may also be elderly, in which case their requirements could be significantly different to those of younger disabled people and their personal assistants who are also likely to be younger. NB the term personal assistant is currently preferred by younger disabled people.

#### **User-research**

Understanding users is key to delivering inclusive and user-friendly environments, products and services. User research can be carried out by designers themselves, in which case it is most likely to be based on direct, often one-to-one contact with appropriate users, and result in an empathic engagement with the users needs and aspirations. Some larger design companies (e.g. IDEO) have in-house user-research specialists, while others develop their own particular approaches, e.g. Ergonomi Design Gruppen's User Pyramid.

#### **User-research methods**

There is a number of specialist publications on user-research methods for design, including The Methods Lab (RCA) and

USERfit (HUSAT for the EU). For details see below. User-research is also carried out by specialist organisations (e.g. RICAbility, The Consumers Association), by market research companies and specialists, and also by academic researchers in medical and health related fields, in age related fields, in design, ergonomics and the social sciences.

#### **Ethnography**

Of particular relevance to designers is ethnographic research – observing users (and users interacting with products etc.) in real life situations. The development of small video cameras and desktop editing software make this a very fertile and rapidly expanding form of design research in both social sciences and the design community.



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Team leader in Btexact customer  
experience group. Interests,  
expertise: usability consultancy,  
research into customer behaviour,  
HCI with particular emphasis on  
Internet design and interactive  
speech services.

**James Mueller**

Project Director, Center for  
Universal Design, North Carolina  
State University. Special interests,  
expertise: Universal Design in  
workplace and consumer product  
design.

**Alan Newell**

Professor, University of Dundee,  
Scotland. Interests, expertise: in  
computer systems to assist older  
people and people with disabilities  
for over thirty years.

**Marcus Ormerod**

Senior lecturer and director of  
SURFACE University of Salford,

[www.surface.co.uk](http://www.surface.co.uk). Interests, expertise: investigating issues of accessibility and inclusive design. main experience is in built environment design.

#### **Katy Owen**

Freelance journalist and disability awareness trainer. Interests, expertise: arts and social science graduate, inclusive society and disability rights.

#### **Elaine Ostroff**

Director, Global Universal Design Educators' Network. Founding director of Adaptive Environments Center, has been working in design education since 1971, has an Ed.M. Harvard.

#### **Jeff Patmore**

Head, internet and multimedia design and solutions at BTexact. Interests, expertise: Cambridge-MIT Institute, affiliate of Crucible, inter-disciplinary design, internet design, HCI, knowledge management, software agents and the semantic web.

#### **Graham Pullin**

Interaction Design, IDEO London. Interests, expertise: interfaces that blur the distinction between inclusive and appropriate design.

#### **Mark Rouncefield**

Senior Research Fellow, Computing Department,

Lancaster University. Special interests, expertise: ethnography, ethnomet hodology, design, workplace studies.

#### **Päivi Tahkokallio**

Project director STAKES, National Research and Development Centre for Welfare and Health in Finland; Co-ordinator Finnish Design for All Network; President of European Institute for Design and Disability; Member of the Design Advisory Group at Royal Society of Arts UK. Special interests: design for all, international DfA networks; design for all education and research; textile art and design.

#### **Raymond Turner**

Principal of Raymond Turner Associates and consulting specialist in design leadership and management. Former Group Design Director of BAA, Design Director London Transport, Senior Design Management Consultant to Eurotunnel, Principal of Wolff Olins and Assistant Chief Executive to Kilkenny Design Consultancy.

#### **Stephen Viller**

Lecturer, Information Environments Program, University of Queensland. Special interests, expertise: computer supported cooperative work. Interaction design, Studio-based teaching of people-centred design.

#### **Nina Warburton**

Director, Alloy Total Product Design. Interests, expertise: inclusive design, digital design, 3D-CAD and communication, telecommunications, consumer electronics, medical equipment and structural packaging.

#### **Stephen Wilcox**

Principal, Design Science. Philadelphia, USA. Specialising in ethnographic research, human factors, and interaction design for product development. He is also a Vice President of the Industrial Designers Society of America.

#### **Mike Woods**

Senior designer, Tangerine product direction and design. Special interests, expertise: product design, design research, user and object relationships, product & brand relationships, inclusivity.

#### **David Yelding**

Director, Research Institute for Consumer Affairs (Ricability) Interests, expertise: consumer education, ergonomics of product design, Information provision and dissemination, research methods.