BRITISH STANDARD

BS
7000-6:2005
Incorporating Corrigenda Nos. 1 and 2

Design management systems —

Part 6: Managing inclusive design — Guide

ICS 03.100

Confirmed
December 2011

BSI
British Standards

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee MS/4, Design management systems, upon which the following bodies were represented:

Association for Project Management
Association of Innovation Management
Association of MBAs
British Standards Society
BSI Consumer Policy Committee
Defence Manufacturers Association
Department of Trade and Industry (Design Policy and Services)
Design Council
Engineering Industries Association
Federation of Small Businesses
Institute of Quality Assurance
Institution of Civil Engineers
Institution of Electrical Engineers
Institution of Engineering Designers
Institution of Mechanical Engineers
Ministry of Defence
NAFEMS
Royal Institute of British Architects
UMIST
University of Glasgow
University of Surrey

Drafting committee

The drafting committee MS/4/-/10, Inclusive design, comprised of representatives from the following organizations:

Association of Greater London Older Women
Association of MBAs
BSI-CPC Consumer Representation in Standardization
Centre of Policy on Ageing
Design Council
Helen Hamlyn Research Centre, Royal College of Art
Royal National Institute for Deaf People
Tesco Stores
The Chartered Institution of Building Services Engineers
University of Cambridge
University of Reading
BSI committee OC/13/-/2 liaison via the Royal National Institute of the Blind

This British Standard was published under the authority of the Standards Policy and strategy Committee on 4 February 2005

Amendments issued since publication

Amd. No	Date	Comments
15638 Corrigendum No. 1	20 May 2005	Correction to Committees responsible
15949 Corrigendum No. 2	18 November 2005	Correction to Figure 2

The following BSI references relate to the work on this British Standard:
Committee reference MS/4
Draft for comment DC04/3008399

ISBN 0 580 44902 5

Contents

Foreword

This Part of BS 7000 has been published under the authority of MS/4.

The BS 7000 series of British Standards currently comprises the following parts:

— *Part 1: Guide to managing innovation*;
— *Part 2: Guide to managing the design of manufactured products*;
— *Part 3: Guide to managing service design*;
— *Part 4: Guide to managing design in construction*;
— *Part 5: Guide to managing obsolescence*;
— *Part 6: Managing inclusive design – Guide*;
— *Part 10: Glossary of terms used in design management*.

The BS 7000 series of British Standards are relevant to all types of products and services, and to the business processes involved in their creation, fabrication, delivery and sustenance in the market, right through to final disposal, including the management of obsolescence. They apply to all levels of staff and management in all types of organizations operating in the manufacturing, process, service and construction industries, as well as in the public and not-for-profit sectors. Those adopting this standard should seek to benefit from all other relevant parts of this series.

BS 7000-6 will be supported by a regularly updated list of useful publications, organizations, links and resources relating to inclusive design. The intention is to guide newcomers to relevant literature and act as an access point to key websites for use at the discretion of readers. This will be hosted by the Design Council at: www.designcouncil.org.uk/inclusivedesign.

In addition, an extended bibliography of related UK, EU and other European standards and more specialist publications will be downloadable in portable document format (pdf). Originally for the joint CEN/CENELEC Working Group CEN/BTWG 113 *Safety and usability of products by people with special needs,* and CENELEC BT/WG 101-5 *Usability and safety of electrical products with reference to people with special needs.*

Users are also advised to consider the desirability of applying the guidance provided by the BS 7000 series of British Standards to fill in the detail relating to managing design when adopting the BS EN ISO 9000, BS ISO/IEC TR 10000, BS EN ISO 14001 and ISO 19000 series, as well as BS 6079, BS 8300 and BS 8800.

Users are invited to submit technical comments, observations and suggestions to the Technical Committee MS/4 Secretary at BSI (see address on back cover). This will assist the Committee when it reviews the standard in due course and considers additional parts to the BS 7000 series.

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Summary of pages

This document comprises a front cover, an inside front cover, pages ii to iv, pages 1 to 47 and a back cover.

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0 Introduction

0.1 General

It is increasingly recognized that disability is not a simple consequence of an individual's impaired capability, but results from a failure to take proper account of the needs, capabilities and preferences of all potential users when designing products and services. Internationally, significant legislation, regulations and changing attitudes within society have created a framework for a more inclusive society.

NOTE See definition of "product" **3.14**.

Organizations that fail to ensure that their products meet the needs of the wider population will be exposed to the possibility of litigation and damage to their reputations. Those adopting a pro-active approach based on a better understanding of consumer needs and aspirations stand to benefit from an improved quality of products; increased sales and customer satisfaction and loyalty; stronger brand values and enhanced brand recognition; greater profitability and improved returns on investment. Everyone benefits.

0.2 What is inclusive design?

Inclusive design is comprehensive, integrated design which encompasses all aspects of a product used by consumers of diverse age and capability in a wide range of contexts, throughout the product's lifecycle from conception to final disposal.

Its ultimate goal is to meet the needs of all such consumers and is based on the principle that appropriate access to information, products and facilities is a fundamental human right.

Inclusive design needs to be a key element in an inclusive business strategy. This standard provides a strategic framework and associated processes by which business executives and design practitioners can understand and respond to the needs of diverse users without stigma or limitations.

Inclusive design recognizes diversity by addressing the ability and preferences, for example, of people who:

— have impaired vision and/or hearing (including colour blindness, etc.);

— are from different cultures (with different languages, values and/or customs);

— have language and/or speech impairments (resulting in difficulties with reading, comprehension and in expressing oneself);

— have physical limitations (whether due to temporary or permanent reductions in strength, movement and/or co-ordination; allergies, sensitivity to electromagnetic radiation, etc.);

— are of different ages;

— have varying cognitive abilities;

— have different dietary requirements for medical reasons or through choice;

— have different requirements because of their gender.

By determining the capability demands of a product on users, it is possible to identify and quantify those who have difficulty with, or cannot use it. Designing products to lessen such demands can attract valuable additional market sectors often excluded by competitors. Indeed, satisfaction is more likely throughout the customer base when usability is ensured for all in the target market population.

The true accessibility of products is determined by the accessibility of their weakest component whether packaging, instructions, interface, after sales service and so on. Concentrating attention on one component while neglecting others is likely to result in a product that is weak overall.

0.3 Why inclusive design?

The business case for adopting an inclusive approach to design is built around five key drivers and opportunities:

1) A better understanding of changing consumer needs, lifestyles, expectations and aspirations: to expand the consumer base, extend product lifecycles and develop brand loyalty.

2) A better alignment of an organization's consumer offer with its customers and markets (such as those due to population ageing, new legislation, technological change and the adoption of inclusive design by competitors): to boost turnover, market shares and returns on investment, hence profitability.

3) A distinctive competency that creates competitive advantage: to create effective user-centred designs and better-integrated product ranges through the application of human factors principles. These encourage repeat purchases, guard against dissatisfaction due to limitations in usability and accessibility, and minimize the cost of servicing and returns.

4) An enhanced ability to identify and exploit opportunities for innovation and the benefits of products: to build and sustain corporate reputation and brand value during social and technological change by surmounting greater design challenges, developing distinctive user-friendly products and generating greater goodwill from powerful overlooked sectors.

5) A closer association between staff, investors, corporate values and mission: to maintain workforce loyalty (particularly in the context of a longer working life for employees, an ageing population and changing expectations with regard to retirement); to improve efficiency, enhance motivation and ensure that essential skills are retained within the company.

In sum, inclusive design makes business sense, reflects on the social responsibility of organizations, and provides visible signals of compliance with legislation.

Annex A provides further information on the challenges of leading inclusivity in business.

1 Scope

Though the inclusive approach ultimately encompasses the whole of business and management, this part of BS 7000 provides guidance on managing inclusive design at both organization and project levels. It seeks to link design thinking with the core concerns of organizations in other established business disciplines.

This standard is aimed at:

a) top executives of all organizations offering products and services. It helps them to lead the introduction of an inclusive approach and evolve an appropriate corporate culture that nurtures inclusive success.

b) middle executives who set up and administer product and service development projects. It helps them formulate better-focused and more enlightened briefs. It also assists in motivating project teams as well as the evaluation of solutions generated.

c) junior executives and specialists who are assigned to project teams that create and develop products and services. It helps them adopt more appropriate perspectives and approaches to inclusive design.

d) executives responsible for procuring outsourced product design services and supplies, and for adhering to agreed specifications. It helps them to sustain the inclusive approach throughout the supply chain.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 3811:1993, *Glossary of terms used in terotechnology.*

BS 4778-3.2:1991, *Quality vocabulary — Part 3: Availability, reliability and maintainability terms — Section 3.2: Glossary of international terms.*

BS 6079 (all parts), *Project management.*

BS 7000-1, *Design management systems — Part 1: Guide to managing innovation.*

BS 7000-2:1997, *Design management systems — Part 2: Guide to managing the design of manufactured products.*

BS 7000-10, *Design management systems — Part 10: Glossary of terms used in design management.*

BS EN ISO 9000:2000, *Quality management systems — Fundamentals and vocabulary.*

BS EN ISO 9999:2002, *Technical aids for persons with disabilities — Classification and terminology.*

BS ISO 10007:2003, *Quality management systems — Guidelines for configuration management.*

PD ISO/IEC Guide 71:2001, *Guidelines for standards developers to address the needs of older persons and persons with disabilities.*

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in BS 7000-1, BS 7000-2, BS 7000-10, BS 3811:1993, BS 4778-3.2:1991, BS 6079-1:2002, BS EN ISO 9000:2000, BS ISO 10007:2003 and PD ISO/IEC Guide 71:2001 and the following apply.

3.1
accessibility
physical and sensory access to buildings, products, services and information

NOTE 1 This may be via, say, speaking browsers, sign language animations and Braille.

NOTE 2 Improved accessibility is now supported by legal requirements under the Disability Discrimination Act 1995 [1] in the UK, etc. (see **A.1.2**).

3.2
accessible design
design focussed on principles of extending standard design to people with some type of performance limitation to maximize the number of potential customers who can readily use a product, building or service

NOTE 1 This can be achieved by:

— designing products, services and environments that are readily usable by most users without any modification;

— making products or services adaptable to different users (adapting user interfaces, etc.);

— having standardized interfaces that are compatible with special products for people with disabilities.

NOTE 2 Terms such as “design for all”, “barrier-free design”, “inclusive design” and “trans-generational design” are used similarly but in different contexts.

NOTE 3 Accessible design is a subset of universal design where products and environments are usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. [PD ISO/IEC Guide 71:2001]

3.3
ageing
process associated with changes in capabilities including the acquisition of progressive multiple minor impairments predominantly related to sight, hearing, dexterity, mobility and cognition

NOTE 1 Ageing, by itself, is not a disability.

NOTE 2 In combination, relatively minor impairments can lead to high levels of disability and dependency.

3.4
capability demand
level of capability, (for example, manual dexterity, visual acuity, colour vision, hearing at specific frequencies, intellectual capability, ambulant mobility) demanded of the user by a product or service in all its aspects including packaging, instructions, interfaces, interaction with service personnel, and promotional literature

3.5
champion
person who is dedicated to, promotes and helps steer an activity to successful completion though not necessarily responsible for any aspect of the activity

3.6
change team

a) group of individuals formally brought together, from within and possibly outside an organization, and given responsibility to effect a specified change

b) individuals who work together informally to get a new idea adopted or act as catalysts within an organization

3.7
corporate

a) top level perspective within all organizations (private, public and not-for-profit)

b) issues that span an entire organization

3.8
design exclusion
inability to use a product, service or facility most commonly because the needs of people who experience motor, sensory and cognitive impairments have not been taken into account during the design process

3.9
disability
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
[BS EN ISO 9999:2002, definition **3.2** (less footnote)]

3.10
impairment
reduction in a person's functional capability: that is, the ability to perform actions or accomplish tasks

NOTE 1 Such reductions have many causes including, but not limited to, specific medical conditions, trauma (accidents), the ageing process, or environmental factors (such as wearing protective clothing or being shaken about on board a train).

NOTE 2 Health conditions, ageing, and traumatic events can all result in impaired capability. Whether this gives rise to disability is determined by social and environmental factors, and importantly the design of environments, products, systems and services.

NOTE 3 For a more detailed definition see PD ISO/IEC Guide 71:2001, definition **3.4**.

3.11
inclusive design
design of mainstream products and/or services that are accessible to, and usable by, people with the widest range of abilities within the widest range of situations without the need for special adaptation or design

3.12
mainstream product
product developed for use by the general population

NOTE 1 Until recently, such products have not been designed with the abilities and preferences of the wider range of users in mind; the inability of these potential users (principally those with impairments) to use such products might lead them to feel excluded from the mainstream of society.

NOTE 2 Social inclusion requires that, in future, mainstream products give due consideration to the needs of the whole population to combat social discrimination, marginalization and conflict due to age, disability, poverty or ethnicity.

3.13
principal
owner-manager, partner, board director and other top executive in the private sector, as well as executive officer in public sector and not-for-profit organizations

3.14
product
result of activities or processes

NOTE 1 A product might include services, hardware (including any core container and protective covering provided), processed materials, software, or a combination thereof.

NOTE 2 A product can be tangible (e.g. assemblies or processed materials) or intangible (e.g. knowledge or concepts), or a combination thereof.

NOTE 3 A product can be either intentional (e.g. offering something to customers) or unintentional (e.g. pollutant or unwanted effects).

NOTE 4 This definition is similar to BS EN ISO 8402:1995, **1.4**.

NOTE 5 In accordance with terminology used in Quality Management Standards (BS EN ISO 9000:2000 series), the term "product" is used throughout this standard to refer to products, services, facilities, processes (including business processes), environments and interfaces.

3.15
usability
extent to which a product can be used by specified individuals to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

[BS EN ISO 9241-11:1998, definition **3.1**]

3.16
user-centred
design approach that places users at the heart of the design process, and involves and engages with users in ways that make them part of, or integral to, the design process itself

NOTE Sometimes called "user-focused", "human-centred" or "co-design" (especially in architecture and planning).

3.17
user-friendly
outcomes that are marketed and promoted in ways highlighting user-friendly features and operations

NOTE Sometimes called "age-friendly", "user-sensitive" or "disability-friendly".

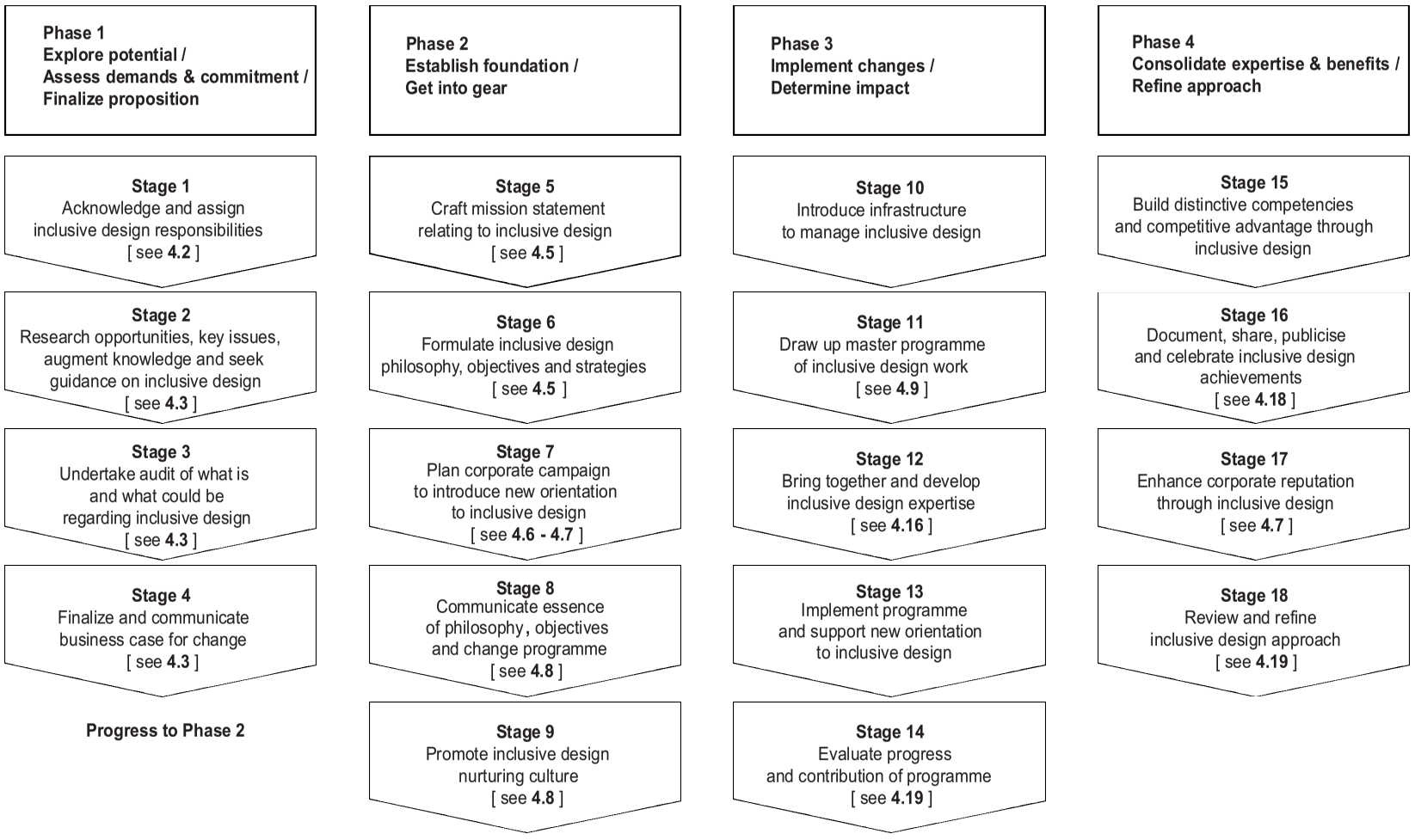
4 Managing inclusive design at the organization level

4.1 General

Clause **4** addresses major issues that relate to the management of inclusive design from the perspective of organizations as a whole. It focuses on the direction and guidance all those involved in undertaking or administering inclusive design activities should expect from Principals (see **3.13**).

A four-phase process should be followed when introducing a professional approach to inclusive design into an organization. This is encapsulated in Figure 1 and **4.20**.

Such an approach requires more than an adjustment of processes and guidelines. The resulting changes of focus can have far-reaching effects across an organization and extend beyond design to other mainstream disciplines. Preparatory groundwork and changes are required to organizational culture and infrastructure which, to be effective over the longer term, need to be driven and supported by top executives.



NOTE 1 This figure sets out the forward momentum of the process. Several stages might be undertaken concurrently and iteration occurs between all stages.

NOTE 2 Bracketed numbers in the chevrons denote the sub-clauses in the main text that details the tasks in that stage.

Figure 1 — Process for adopting a professional approach to inclusive design at the organization level

4.2 Responsibility for inclusive and assignment of tasks

The quality of design achieved is influenced far more by those who manage design than the specialists who undertake the creative work. Therefore, it is essential that competent, experienced executives are assigned responsibility for inclusive design.

Ultimate responsibility for the quality of design produced by, or on behalf of, organizations rests with Principals who fulfil the roles of Chairman or Chief Executive.

Principals are also collectively responsible for ensuring that their organizations have a clear stance with respect to inclusive design (not least by challenging prejudices and stereotypes), the stated direction is followed effectively, and all resources are harnessed to their full potential so inclusive design makes a significant contribution to corporate performance. This includes promoting, building and sustaining an appropriate organizational culture. They should ensure that all their executives and staff know whom to turn to for guidance, authorization and direction regarding initiatives and other decisions relating to inclusive design.

Chief Executives might assign day-to-day executive responsibility to senior colleagues who report directly to them. All individuals with responsibilities for design should demonstrate a clear commitment to inclusive design through their statements and actions. Job descriptions should state clearly their roles and responsibilities in promoting inclusive design; these should be reviewed periodically and updated. Their performance should be assessed against set inclusive objectives and responsibilities.

4.3 Reviews of current operations, facilities, knowledge and achievements

4.3.1 *General*

Objectives should be set for all reviews to help build the business case for adopting an inclusive approach to design.

Such reviews often require the assistance of experts (and expert users), to identify and raise understanding of key issues, develop the necessary skills, support internal champions and complete the necessary assessments. The greater independence of outside experts and users should also raise the credibility of (and confidence in) the findings.

The outcome of these reviews should be used to formulate and communicate the business case for adopting an inclusive approach to design. This gives the prime reasons for change and the likely costs of maintaining the status quo. It also provides preliminary assessments of the opportunities to be exploited, likely commitment of resources and anticipated benefits.

NOTE BS 5760-14:1993 and BS EN ISO 19011:2002 provide further guidance on general review procedures.

4.3.2 *Internal reviews*

Internal reviews of an organization's current designs, operations, resources and facilities form one of the crucial foundations to a professional approach to inclusive design. Internal reviews should cover the following:

a) products, associated outputs and services (for example packaging, promotional literature and user manuals, point-of-sale material), assistance with installation, use, and servicing;

b) facilities (such as exterior and interior environments of workshops, showrooms, offices, warehouses, sites) covering ease of access (approaching, entering and leaving) and navigating around facilities, access to information, opportunities to use the full range of amenities provided and cope with security;

c) equipment, other design aids (hardware and software) and ancillary support covering intuitive operation, interaction, ease of use, adaptation and support;

d) nature and extent of prejudice within organization;

e) range of design and design management skills, knowledge and experience available in-house or bought in; gaps relating to inclusive design and implications for recruitment and training;

f) design and design management procedures;

g) technologies (currently used in operations, output and facilities);

h) legislation and standards (internally generated or externally imposed, documentation, compliance, sanctions applied to ensure conformity), as well as their impact on organization's operations, output and reputations.

Products, services, associated outputs, resources and facilities should be checked to determine whether any of the targeted audiences are excluded unnecessarily. Where such exclusion is revealed, it should be established whether the product should be comprehensively redesigned or adaptations provided. Similarly deficient bought-in equipment and design aids should be changed.

4.3.3 *External reviews*

External reviews constitute another crucial foundation to a professional approach and should cover:

a) body of knowledge relating to inclusive design;

b) competitors' products, associated outputs and services, facilities, equipment and other design aids;

c) stance, standards, skills, practices, experiences and achievements of "best in class" organizations;

d) existing and emerging technologies (to check new developments and trends);

e) likely changes in legislation and standards (and sanctions on non-conformity) in the foreseeable future;

f) potential candidates for strategic alliances.

4.4 Formulation of inclusive design mission statement, objectives, strategies and plans

When formulating the inclusive design mission statement, objectives strategies and plans, Principals should:

a) formulate an inclusive design mission statement that enhances and gives greater practical meaning to their business mission statement. This should articulate their organization's general stance towards inclusive design, the prime reasons for adopting a rigorous and professional approach to it, as well as the key contributions of it to corporate performance.

b) ensure that all design activities and investments facilitate the achievement of an organization's overall objectives. This requires that they tie in closely with an organization's strategic intent and activities in other disciplines.

c) ensure that design implications are carefully thought through and clearly documented, working from the basis of an organization's overall business objectives, culture, future vision and strategies. This analysis should be used to formulate the inclusive design objectives and strategies (preferably quantified) together with criteria against which performance can be gauged. In this way, Principals can ensure that corporate objectives provide the foundation and main thrust for all inclusive design, and resources are harnessed to their full potential to achieve those objectives.

d) address relevant inclusive design issues during the planning cycle, and ensure that the results of deliberations are documented in all key plans; strategic, business, operating, and departmental. If a separate section for design cannot be created within plans, these issues should be clearly identified in other sections of key plans. Where appropriate, the inclusive design dimension of an organization's planned activities and range of products/outputs could be expanded into a separate document.

NOTE BS 7000-1 and BS 7000-2 provide further guidance in this area.

4.5 Initiating a corporate campaign to introduce a new orientation towards inclusive design

Introducing significant change into organizations, especially when core values and corporate culture are affected, requires rigorous planning to ensure smooth implementation and full benefits are realized. Therefore considerable care should be exercised when managing a change in orientation towards inclusive design. This involves:

a) raising awareness and establishing a shared need to embrace inclusive design, by building a business case around key issues and opportunities to create competitive advantage and raise corporate reputation;

b) shaping an inspiring vision and drawing up guiding principles;

c) formulating a programme to introduce the change;

d) mobilizing commitment to effect and sustain the change;

e) leading the change, assisted by a Change Team;

f) communicating the change widely through different media;

g) aligning the infrastructure (with formal procedures for approved practice);

h) sustaining momentum;

i) celebrating achievements;

j) embedding change in the organization;

k) establishing the foundation for further change.

Cultural change should be implemented by creating Change Teams with sufficient authority to ensure that all those affected:

a) are suitably prepared;

b) understand the importance of key issues to future success;

c) are clear about what to expect and how they themselves will contribute.

4.6 Communication of inclusive design objectives, strategies and programme

The inclusive design mission statement, objectives and strategies define the boundaries of what is acceptable to the organization in relation to inclusive design investments and activities.

Principals and staff need to be fully aware of the direction and objectives set for inclusive design so all focus their efforts and work in unison. Considerable benefits should derive from communicating the essence of plans widely through:

a) team briefings, reports and notice boards;

b) intranets;

c) newsletters and magazines;

d) staff conferences and training.

Staff should understand that they, too, are essential to the successful implementation of these plans.

Stakeholders outside the organization should be kept appropriately informed. This can reassure them that there is clear direction and leadership to turn visions of the future into reality. Principals should take advantage of all channels of communication to publicize and explain objectives, approaches and programme. This can be achieved, for example, through the organization's:

a) website;

b) annual reports and corporate literature;

c) briefings to financial institutions, customers and partners in the supply chain;

d) advertising, product publicity, trade shows and professional conferences.

The language and terms used in all these instances should be appropriate and acceptable to all stakeholders who might have been excluded previously.

4.7 Introducing inclusivity into corporate identity and culture

Those who manage inclusive design should take account of the corporate identity and culture of the organization, the physical, operational and human features, as well as values that give an organization its unique personality.

Care should also be taken to ensure that the designs of products reflect and enhance the organization's identity. All these factors, together with design management procedures, should be refined to align with an inclusive design mission statement.

4.8 Corporate infrastructure for managing inclusive design

Principals should create an infrastructure for the effective management of inclusive design that extend beyond their personal interests and approaches. That system of values, procedures and standards should be promoted to the point where it is fully implemented, operates smoothly, is openly appreciated, lived day-to-day and firmly embedded within the organization.

NOTE Further guidance on the key issues encompassed by design management systems is provided in BS 7000-1 and BS 7000-2.

4.9 Inclusive design in the master design programme

All approved proposals for investments in inclusive design should be co-ordinated within a master design programme setting out activities, outcomes sought, and contributions to the attainment of the organization's overall objectives.

The programme should summarize design briefs or specifications, skills and other resources to be committed, outputs generated, and planned work set under clear phases with associated timescales. It should be accessible to all involved in inclusive design in a practical central format for example, working document, compact disk and intranet.

Principals should refine the procedure for generating new project opportunities and nurture a pro-active attitude among colleagues. Staff should have an open invitation to suggest how inclusive design might contribute tangibly to corporate performance, with appropriate support to develop these suggestions into formal project proposals. As a result, more opportunities will be captured, proposals will be formulated with proper consideration of the inclusive dimension and they will be acted on more efficiently.

Inclusive design objectives, strategies and programmes should be reviewed regularly by Principals to check their continuing relevance and effectiveness in taking the organization forward.

4.10 Totality of products, services, processes and facilities

Customer satisfaction arises out of their experiences with products and organizations from first awareness to final disposal/contact. It is crucial to business success and brand loyalty: all are hard won and easily lost. One defining moment is when consumers first open a product pack or access a service: that formative experience could be marred by frustration and disappointment.

Principals and designers should adopt the viewpoint of users' total experiences, encompassing all factors valued by users that make products inclusive (e.g. access, use and support). No experience should be overlooked. So it is manifestly counter-productive when a well-designed product is installed inappropriately, such as a telephone fixed too high on a wall for people in wheelchairs to reach. Guidance should be provided to ensure that products are disposed of responsibly, especially where users are incapacitated and components can be recycled.

Inclusive design is comprehensive, integrated design which encompasses the complete lifecycle of products from beginning to end. Products should be planned to progress seamlessly through their lifecycles. Product development projects should progress smoothly from stage to stage, from initiation through to completion (see also **5.2.4**). Design teams should retain responsibility for the quality of the products they create throughout. In embracing inclusive design, Principals should promote close links and co-ordinate work across all disciplines, dismantle functional barriers and encourage true inter-disciplinary teamwork.

Principals and staff should identify all elements that contribute to these experiences and determine the priority and value set on them by customers and users to raise the attraction and competitiveness of their products and organizations (see Figure 4).

4.11 Closeness to markets and success of products

Keeping close to customers and being aware of the nature of potential markets greatly increases the chances of success with new products. Often, factors that exclude, dissatisfy and alienate are designed into products through untested assumptions about consumer behaviour and preferences. For example, video recorders that are hard to programme might be deficient because controls are difficult to read and manipulate, functions are not intuitive in operation, and manuals confuse.

Observing how users interact with products, from the moment they first become aware of a product (or perhaps take it out of its packaging) to final disposal, can be particularly instructive in revealing opportunities for new products, improvements to existing products and different ways to present products to market. Care should be taken to establish whether expressed needs and views are those that most influence purchase decisions and reinforce satisfaction with repeated use.

Principals can do much to raise performance by insisting that research is undertaken continuously into customer/user attitudes, aspirations, work and life-styles. They should ensure subjects are suitably representative and conclusions are valid, and then act on findings without undue delay.

Colleagues, user group representatives and suppliers should be involved in the active search to improve the quality of consumer offers. Links should be established with previously excluded user groups to gain richer feedback (ideally as part of corporate social responsibility programmes), and strategic partnerships considered with key customers and suppliers.

4.12 Product development and marketing strategies

4.12.1 *Range strategy*

Ideally, organizations should create and market integrated ranges of products that are suitable for all potential users; however this is not always possible. Therefore, a key decision that needs to be made early relates to whether inclusive products will form:

a) a complete integrated range without the need for adaptive accessories;

b) new models to be added to a range and adaptive accessories developed for existing products;

c) a complementary range, co-ordinated visually and technically to some degree with the existing range;

d) a separate range with no connection to mainstream offers (for example, manufactured by a different company, marketed under a different brand and distributed through a different supply chain).

4.12.2 *Product development strategy*

In product development, three basic strategies should be considered. The least disruptive from an organization's viewpoint is to develop add-on options for current products (through accessible design) to make them effective for previously excluded users. However, the outcomes of this strategy might not be attractive to disabled users because of the visual and practical awkwardness of results, the probable premium price charged, and the inherent messages (or stigma) conveyed to customers regarding their status.

Alternatively, current products might be upgraded relatively quickly and at low cost through superficial changes that increase their suitability for wider target markets (e.g. by amending the design of controls, size of displays, overall weight and colour schemes).

The most extensive and longer-term strategy is to rethink all design aspects of existing products using inclusive principles so as to appeal to all targeted customers and users.

4.12.3 *Marketing strategy*

Inclusive products might feature the existing "mainstream" brand or a brand created specifically for the new range. They would probably be handled by the existing marketing team after appropriate re-orientation and training.

Where specialist expertise is required and a significantly different supply chain indicated consideration should be given to establishing a separate team to serve the additional market sectors. The new team could be employed by the same or an associate company.

Whether products are co-ordinated visually might be influenced by the following factors:

a) strength of an organization's corporate and visual identities;

b) split of product ranges into brands with distinct identities;

c) commercial benefits (and costs) of being clearly differentiated from the competition in terms of consumer preference, greater market recognition and loyalty, and opportunities for cross-selling;

d) savings from rationalization, modularity of product configurations, as well as consistency in presentation.

NOTE BS 7000-1 and BS 7000-2 provide further guidance in these areas.

4.13 Impact of launch on lifetime profitability of product

A successful launch and on-going support in the market can substantially affect the uptake and the lifetime profitability of a product, hence an organization's reputation.

Launch Champions should be identified early on in design development projects to plan and oversee this crucial stage. These champions should ensure that launches promote inclusive, easy to use features without detriment to a product's broader market appeal.

Project budgets should incorporate sufficient funding for launches. Commitment should also be obtained from all relevant parties especially where subsidiaries, partners, agents and licensees are involved in several countries around the world.

4.14 Promotion, distribution, customer support and disposal

The following components are significant contributors to customer experiences:

a) advertising, promotional literature and word-of-mouth endorsements;

b) user instructions;

c) packaging, presentation in shops and showroom environment, courtesy and proficiency of sales staff;

d) availability and professionalism of delivery;

e) after-sales support and the rapid response and efficiency of the service team;

f) ease of disposal and recycling in responsible manner.

Principals should insist that quality is maintained across all these components of the augmented product so they are seen to be mutually-enhancing parts of an attractive whole. Key to this is that staff should be properly informed of the inclusive design dimension of the products they handle, and behave with appropriate sensitivity to fulfil customers' and users' expectations.

4.15 Legal aspects of managing inclusive design

All organizations operate to standards, the majority of which are imposed from outside through legislation, customer demand, professional regulation and competitive action.

The legal dimension of inclusive design is critically important because of increasingly stringent statutory regulations, more frequent litigation by those affected adversely by products, and higher compensation for successful litigants. Principals need to exercise considerable care and rigour to ensure that their organizations comply with all relevant laws wherever they operate and, if appropriate, exceed required standards to achieve competitive advantage.

Principals should put in place a system to protect their intellectual assets, and endeavour to make appropriate representations to influence proposed new standards or changes in regulations and laws. Vigilance is required to keep up-to-date with changing interpretations of legislation.

NOTE BS 7000-1 and BS 7000-2 provide further guidance in this area.

4.16 Innovative alliances

Principals should consider harnessing the greater inclusive design skills and experience of external parties to help advance the technologies, design, delivery and support required for future products. Collaborative initiatives and alliances should be formed with customers, suppliers, distributors, expert consultants, universities, research institutions and even competitors, to enhance inclusivity of products through, for example, range extension by third parties.

NOTE BS 7000-1 and BS 7000-2 provide further guidance in this area.

4.17 Investment programmes featuring inclusive design

Insufficient investment in the creation of new inclusive products is very likely to jeopardize future competitiveness and profitability. Principals should ensure that the necessary resources are committed to undertake the inclusive elements of research, design and development work indicated in the master design programme.

Executives at all levels in public sector organizations should ensure they gain appropriate investment approval from relevant government departments, whilst voluntary agencies will need to satisfy their governing bodies.

Formal programmes of investment in inclusive design should also provide for training that:

a) raises awareness of inclusive design among employees at all levels, and enhances their ability to work inclusively;

b) develops design management skills to direct inclusive design activities.

Where appropriate, customers, suppliers, distributors and agents should be offered the opportunity to join in such training, for those who train together often relate and work better together. Substantial benefits could derive from better understanding between the parties, use of a common language, as well as a convergence of attitudes and closer integration of approaches.

Risk assessments should be carried out on all programmes to ensure that the desired outcomes are feasible within available resources and no activity exposes the organization to unnecessary or inordinate risk (see also **5.2.10**).

NOTE BS EN ISO 19011:2002, BS 7000-1 and BS 7000-2 provide more detail on financial and resource plans.

4.18 Reviews and control of inclusive design standards, activities and procedures

Principals are responsible for monitoring the quality of design work undertaken by, or on behalf of, their organizations. This requires regular reviews of outcomes from different departments, facilities, subsidiaries and agents. Reviews should enable the creativity of ideas and quality of their execution to be checked, as well as conformance with standards. They should also cover inclusive design and management procedures. The same applies to facilities (location and quality of work environment, amenities, equipment and so on).

There should be a formal procedure for monitoring the progress of the master design programme, with reviews scheduled into the programme itself. Staff involved in inclusive design work should participate. Outcomes should be formally documented and circulated widely within the organization, especially to those who can act on the information to improve performance. Principals should be informed of any slippage in plans, deviations from goals, and remedial action taken.

4.19 Evaluation of corporate performance

Evaluation at the organization level encompasses several aspects of managing inclusive design. Significant assessments relate to:

a) the overall contribution of inclusive design to the performance of an organization, (especially progress made towards the fulfilment of design and corporate objectives, the additional benefits derived from promoting an inclusive approach, and the financial impact of the solutions generated);

b) the net additional costs of an inclusive design programme (assessed against the whole-life returns achieved as well as capital and opportunity costs);

c) the master design programme (including control of progress, addressing an organization's inclusive requirements, proper resourcing of activities, effective integration of all disciplines in innovative activities, and reinforcement of the inclusive approach within the organization).

Responsibility for undertaking appropriate evaluations to help achieve improved performance lies with Principals and design leaders. They should ensure that there are formal procedures by which investments in inclusive design are evaluated, sanctioned then reviewed. These should be documented, transparent and well understood throughout the organization. They should also ensure that the lessons learnt are properly documented and disseminated to avoid repeating mistakes and unnecessary duplication of work.

Another likely benefit from rigorous evaluation is that problems will be anticipated or diagnosed earlier, leading to prompter, more effective action. Evaluation can also serve to reinforce and embed change.

Finally, the performance of those with responsibilities for inclusive design should be evaluated at appropriate intervals. This might lead to revisions of job descriptions, adjustments in responsibilities, seniority, reporting lines, as well as the calibre and mix of skills sought.

4.20 Summary checklist for introducing a professional approach to inclusive design management into an organization

The following summary should help Principals to handle inclusive design professionally (see Figure 1):

a) *Phase 1 – Explore potential/Assess demands and commitment/Finalize proposition*:

1) Acknowledge responsibilities for the quality of inclusive design generated and address key issues regularly at board meetings. Assign inclusive design responsibilities to competent executives, then motivate them to achieve their targets.

2) Research opportunities and key issues, augment knowledge and seek guidance on inclusive design, such as demographic changes, shifting consumer expectations, existing and likely legislation, and standards relating to inclusive design. Also research their implications for the organization, its products, operations and facilities to raise understanding of key issues.

3) Undertake audits of "what is and what could be" regarding inclusive design. Audit the organization's consumer offer, operations and facilities perhaps with assistance of experts and targeted users working with in-house teams. Determine extent of exclusion (how many consumers are inadequately catered for or discouraged).

4) Communicate the business case for the organization to embrace inclusive design. Promote an inclusive perspective encompassing the whole business (not just design). Challenge prejudices and stereotypes, and maintain a visible commitment to inclusive design.

b) *Phase 2 – Establish foundation/Get into gear:*

1) Craft a mission statement relating to inclusive design that ties in with the organization's strategic intent, makes its overall vision more tangible internally and externally, so contributes directly towards achieving its overall goals.

2) Formulate a corporate design philosophy, objectives and strategies. Ensure that longer-term business plans reflect market needs and trends to enable the organization to grasp opportunities for growth and create competitive advantage. Insist that strategic plans address key issues and incorporate explicit statements relating to inclusive management and design.

3) Plan a corporate campaign to introduce new orientation to inclusive design. All organizational change should be planned in detail and executed meticulously to achieve success over the long term. Identify champions to spearhead that campaign.

4) Communicate the essence of philosophy, objectives and change programme. Ensure that everyone throughout the organization is properly informed of the proposed changes, why they are necessary, and how they will unfold over the foreseeable future. Champions should also ensure that colleagues understand what is expected of them and there is an appropriate degree of 'buy-in' even before the campaign starts.

5) Promote a nurturing culture for inclusive design. Reinforce the profile of inclusive design by acknowledging its value in raising corporate performance, and ensure that it features in the folklore of a company. Insist that inclusive design is administered to the highest standards without concession. Demonstrate pro-active support and enlightened commitment over the long term to enable inclusive design to establish firm roots and flourish.

c) *Phase 3 – Implement changes/Determine impact:*

1) Introduce the infrastructure and systems necessary to implement the inclusive design mission, administer the master programme, and ensure that inclusive design is embedded into other disciplines.

2) Draw up a master programme of inclusive design work that enhances the organization's other major plans. Specify criteria against which initiatives relating to inclusive design will be sought and approved. Review and update programme at appropriate intervals to sustain relevance in fulfilling corporate objectives. Allocate and ring-fence the necessary finance and other resources to enable this programme to be carried out effectively.

3) Bring together and develop inclusive design expertise. Ensure proper consultation with inclusive design specialists and users to validate all project proposals. Involve employees as well as key user groups in an active search to improve the organization's customer offer. Strengthen links with these groups, ideally within a corporate social responsibility programme. These might include older or disabled users. Harness the expertise of appropriate partners throughout the supply chain.

4) Implement master programme and support new orientation to inclusive design.

5) Evaluate progress and contribution of programme. Monitor and control performance and expenditures against plans, then determine the returns on investment on all resources committed to inclusive design (not just capital). Compare contribution of, and return from inclusive design with investments in other business disciplines. In particular, document the distinctive outcomes as well as extraordinary achievements through inclusive design.

d) *Phase 4 – Consolidate expertise and benefits/Refine approach:*

1) Develop inclusive design as a leading competency that creates competitive advantage. Constantly reinforce inclusive design mission, extend objectives and enhance master programme to maintain the challenges presented. Evolve unique insights and methods to apply to product development. Establish training programmes for executives, staff and other partners to promote the right attitude and skills relating to inclusive design throughout the organization.

2) Document, share, publicize and celebrate inclusive design achievements to make contributions to corporate performance more tangible and assign credit properly where it is due. Collate evidence and gain acknowledgement that inclusive design is a vibrant, embedded part of corporate culture.

3) Enhance corporate reputation through inclusive design. Build inclusive design into an important distinguishing characteristic of corporate reputation that is backed up with extensive evidence of solid achievement. Establish inclusive design as a key driver, and the most visible deliverer, of corporate social responsibility.

4) Review and refine inclusive design approach. Enhance a regime of continuous improvement with more substantial longer-term reviews that reflect increased confidence and credibility as a result of mounting successes reinforced by quantified achievements. Carry inclusive approach through to other business units, facilities, supply chain, and partner organizations.

5 Managing inclusive design at the project level

5.1 General

This clause addresses those activities in managing inclusive design that are specific to projects. Ideally, before following the guidance in this clause, owner-managers, partners, board directors and executive officers should have undertaken a fair deal of the work at organization level set out in Clause **4**. That foundation will influence the likely success of work at the project level.

5.2 Overview of managing inclusive design projects

5.2.1 *Primary project stages*

Figure 2 maps out a model project management system with eleven primary stages of inclusive design projects under three phases. This is activated when a master programme of inclusive design work is formulated for an organization (see Figure 1). Principals and project leaders might wish to customize the model to their particular circumstances.

NOTE More detailed guidance on project management is given in BS 7000-1, BS 7000-2, BS 7000-3 and BS 6079-1:2002.

Figure 3 to Figure 13 provide the detail relating to individual project stages, in particular the tasks relating to inclusive design.

5.2.2 *Commitment of expenditure*

Most of the lifetime costs of new products (typically over 80 %) are fixed during the design phase of development projects. Yet the design process claims the least expenditure (typically no more than 15 % of project budgets).

Moreover, around 45 % of the total expenditure in the stages prior to full-scale production occurs towards the end of the design and development phase: capital expenditure necessary to acquire manufacturing facilities (premises, tooling and equipment), the purchase of raw materials and bought-in goods, as well as the recruitment and training of staff.

Early identification and resolution of inclusive design issues and related factors will save considerable time, effort and expenditure in later stages. Therefore, it is essential that there is firm management commitment to, and support for, an inclusive approach from the start of the design process.

5.2.3 *Concurrent processing*

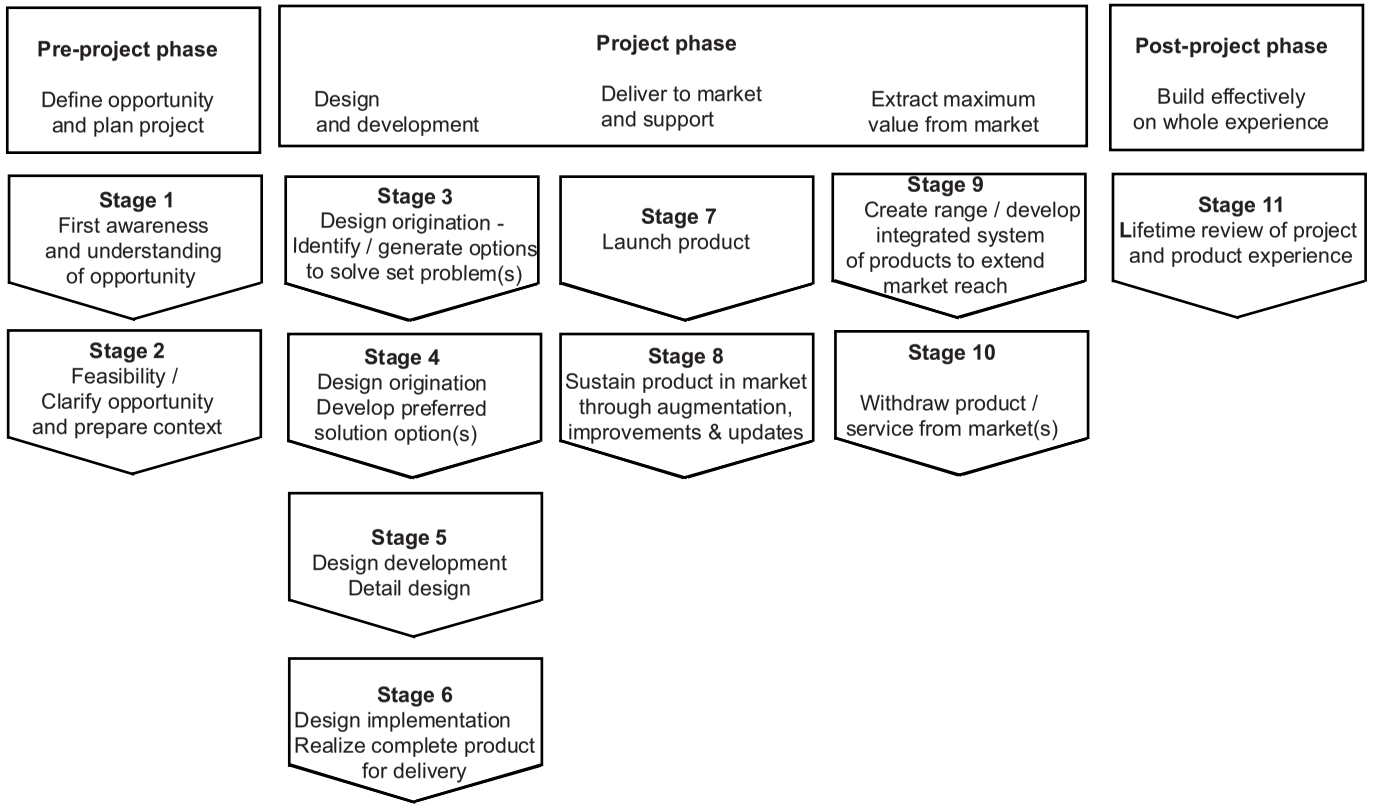
Where possible, project activities (even stages) should be undertaken in parallel. Such concurrent processing can yield significant savings in timescales and costs (e.g. by getting the design right when first released), thus reducing the need for changes to correct problems revealed later in the process. Giving authority and influence to inclusive design champions can greatly enhance the savings and other benefits resulting from concurrent processing.

Ideally, all necessary information on functional requirements should be collated at the beginning of each design activity, and all information required for a stage should either have been generated in a previous stage or become available during the stage itself.

5.2.4 *Focus and iteration between stages*

Design projects should be managed to ensure successive stages follow smoothly and remain focused on the principal objectives set when projects are formally sanctioned. Fragmentation should be avoided, especially where different team members pursue diverging, often conflicting, aims.

The relative importance and sequencing of stages can vary by project. Iteration is often essential. Feedback should be encouraged at all stages to raise the chance that designs are optimized.



NOTE This figure sets out the forward momentum of projects. Several stages might be undertaken concurrently and iteration occurs between all stages.

Figure 2 — Map of primary design project stages

5.2.5 *Stage gateways/reviews*

Progression from one project stage to another, and completion of work in any particular stage, should be marked by formal reviews (or gateways) that cover the following:

a) Review of work in the immediately preceding stage (and prior stages as appropriate), especially reinforcement of achievements to that point.

b) Confirmation that the corporate context and business environment are unchanged, and project objectives/strategies remain relevant, with specific reference to inclusivity and consumer expectations.

c) Refocusing project if divergence from aims or fragmentation are detected.

Stage gateway decisions include:

a) Approval of stage work and go-ahead to proceed immediately to next stage.

b) Sanctioning progress to the next stage but with specified amendments (perhaps relating to output generated, stated aims, strategies, resources, etc.).

c) Demanding amendments and re-submission before progressing further.

d) Putting the project on hold either indefinitely or to review/continue at a specified date.

e) Rejection of stage work and instruction that the stage is repeated.

f) Referring the project team back to an earlier stage for reworking (perhaps because some factor has altered).

g) Stopping work and abandoning the project.

5.2.6 *Core and augmented project teams*

When projects are initiated, consideration should be given to forming a small informal group of appropriate individuals who could later become the nucleus of the project and design teams. These are frequently augmented by in-house colleagues and external partners at various stages when their expertise is required.

5.2.7 *Formulation of project proposals*

A project proposal is probably the most important document in the creation of any product. It should include relevant background information, with clearly targeted users and markets, an inspiring inclusive design brief, preliminary decisions on development strategy, a realistic work programme and resource commitments. Indeed, a project proposal should have something to say about every stage, from trigger through to disposal of products. Inclusive design criteria should be set to monitor progress and select a solution concept later in the project.

BS 7000-2:1997, Figure 4 sets out a non-exhaustive list of factors to be considered when compiling a creative brief. An inclusive design approach requires that this list be augmented with regard to the customer or end user, in particular by considering the following factors:

a) Who are the customers: what groups/segments are buying and might want to buy the product?

b) How customers view current market offers: an organization's own product(s), its competitors' products, and the overall sector?

c) Where are customers going: how are lifestyles/society/age bands changing, how will these affect the market?

d) What are the detailed needs of customer groups: by age, affluence, capability (functional and cognitive)?

e) Are there any specific groups to consider, not large numerically but who are vocal or have specific needs?

f) What are customers' expectations with regard to usability and accessibility? How are these protected by legislation. To what extent can the product be reasonably expected to deliver on expectations?

g) Who is being excluded as potential customers, and why? Is any reason for exclusion reasonable? How might this affect sales, reputation, brand positioning, exposure to complaints and litigation?

Factors should be extended in other ways. For example, performance and packaging requirements should encompass ease of opening, legibility, and completeness of information relating to diet, allergies, etc. Not all factors will apply in every case, however it is only by considering them all that the important inclusive factors become apparent.

5.2.8 *Expert guidance and feedback*

When adopting an inclusive approach, there is considerable value in obtaining regular guidance and feedback from appropriate specialists and targeted users during the design process. They help ensure that approaches and solutions proposed are appropriate and valued, effectively helping to validate what is done and verify outcomes.

Keeping inclusive design partners closely involved throughout projects also helps to ensure that the most up-to-date knowledge and experience are brought to bear. Inclusive design champions and user representatives fulfil crucially important roles here.

5.2.9 *Design strategy*

Apart from the product development and marketing strategy issues at the organizational level set out in **4.12**, it is important to agree (or impose) an appropriate design strategy to guide work at the project level. For example, will solutions be sought for worst-case scenarios or will a more balanced brief be set? In some circumstances, the former might seek to cater for the most disabled people who use a product. This could lead to over-specified products that mainstream customers perceive to be relatively unattractive or cumbersome.

Advantage should be taken of the opportunity to undertake some fundamental rethinking to simplify products and make them more intuitive in use. Indeed, efforts might be made to simplify production processes so they can be undertaken efficiently by disabled operatives. The supply chain might also be opened up to nurture new suppliers.

5.2.10 *Risk assessment*

All decisions to include or exclude categories of users and market sectors should be made on the potential to serve a wider spectrum of needs, fill niches, capture greater market share, defend market positions and enhance corporate reputation. Possible financial outcomes should be estimated, with particular attention given to current and proposed legislation relating to all targeted markets.

In each case, assessments should be made of the risks arising from upgrading specifications, stretching market reach, damage to corporate reputation following technical and market failures, potential legal action, and what could be perceived to be an unsympathetic ("exclusive") company culture.

5.2.11 *Strict control of compromises and documentation of design changes*

Particular care should be taken to see that practical compromises are in line with guiding principles of inclusive design. Characteristics of concepts that led to their approval for development should be defended with special vigour to ensure the integrity of design solutions is not compromised as projects progress.

The consequences of compromises should also be carefully assessed in relation to changes in usability. For example:

a) making product functions more accessible to disabled users, as in the case of medicine containers, might increase dangers to small children;

b) lift controls should be low enough to be within reach of wheelchair users but some visually impaired people need them at eye level;

c) mobile phone users who have poor co-ordination and manipulative skill need widely spaced buttons, whereas a one-handed user needs a compact unit that is easy to hold and operate at the same time.

It is advisable to record all design changes during the course of projects, together with the rationale and validating data underlying these and subsequent decisions. Such records are invaluable when evaluating projects and also when defending decisions and approaches taken, perhaps during legal proceedings.

Another good practice is to record all valuable lessons and achievements as they happen. This knowledge and experience can then be captured vividly and acted on quickly while fresh.

5.2.12 *Tools and techniques*

Many tools and techniques are available to aid the design of inclusive products, and organizations are likely to develop their own user research processes and methodologies. Some focus on countering design exclusion by identifying the factors that cause unnecessary or avoidable difficulty; others focus on working with, and understanding, users.

To be effective, these methods need to be applied within an inclusive design culture and strategy. They help designers, and researchers attached to design teams, to address the needs of the wider range of users by re-defining design problems at the outset to include users with a wider range of capabilities and so deliver more inclusive outcomes.

Tools and techniques applicable to each project stage are suggested in Figure 3 to Figure 13. Some are applicable in several project stages. Their usefulness varies from project to project, as well as the sectors in which organizations operate and nature of products being developed. These are described briefly in Annex B, and further information can be obtained from the bibliography (and websites listed therein).

NOTE The suggested tools and techniques are not definitive or exclusive.

Due consideration should be given to customers and end users at each stage of development, and care taken to employ the most appropriate methods, for example, written questionnaires are not easily accessible to those with visual or cognitive impairments.

Clear metrics should be established for stage reviews, both to ensure rational decision-making and as part of the overall documentation process.

5.2.13 *Effective presentation to ensure common understanding of target users*

Lack of awareness of the full range of potential users and environments are a significant cause of design exclusion. Similar limitations in perspective exist in marketing, advertising and after-sales support. Therefore it is essential to brief design development teams that not all users are young and able-bodied or, indeed, like themselves. Perspectives can also be broadened by compiling user profiles early in a project, and taking steps to ensure that relevant user-data is accumulated and validated throughout the development process.

It is important that all information, especially when compiled by specialist researchers from collected user data, is presented in formats that are accessible to project team members (especially designers), management, marketing and sales, and other key audiences. This will ensure there is a common understanding of target users throughout the development, production, marketing and after sales stages.

5.2.14 *Involving users in the development process*

Products should be assessed and verified at all stages throughout the design process to identify sources of exclusion as early as possible, when they are comparatively straight-forward to rectify at low cost. A formal verification procedure should be in place. The same rigorous attention should be paid to packaging, advertising, marketing, education/training, customer service and other factors in the supply chain to ensure that a product's inclusivity is not compromised when delivered to market.

Involving users throughout the design process provides rapid, detailed feedback on sources of potential difficulty for them. This is particularly effective for project team members who are unfamiliar with the extremes of the user population. Many users with functional impairments develop novel coping strategies and techniques for using products; these can be extremely valuable in the design process, so care should be taken to record and learn from them.

In all instances, careful sampling of users is critical. There are three possible approaches:

a) Involve a sample that is representative of the entire market segment. This has the advantage of providing an overview of whole market sectors. However, a large sample is required to identify all the different kinds of users, and an even larger sample to determine all their difficulties;

b) Involve only users with the lowest capabilities. These samples highlight accessibility problems however, as such users normally constitute minorities, resulting designs might be unduly biased towards their needs, or might not address the needs of people with less severe impediments;

NOTE Involving only users with the lowest capabilities might not be the best strategy in all cases. For example, people who have been totally blind since birth might have the severest visual limitations, yet their input might do little to make a design more useful for those with low vision, for whom a large, high contrast print can be instrumental. This situation is similar for those with hearing, manual, mobility, and cognitive limitations.

c) Involve those who should be able to use the product but currently cannot. Most relevant accessibility issues can be discovered with a comparatively small set of carefully chosen users. However, these users are among the most difficult to identify and recruit.

5.3 Primary stages of inclusive design projects

Projects are initiated when shortcomings and gaps are revealed in current or potential markets, perhaps as the result of an audit of an organization's or competitors' operations; when someone decides to take action on the inclusive design opportunities presented; or following market research, user consultation, or more pro-active identification of opportunities through creative thinking techniques, use of specialist consultants or other methods outlined in Annex B.

Figure 3 to Figure 13 provide the detail of all eleven primary stages to be followed in inclusive design projects.

Pre-project phase: Define opportunity and plan project
Stage 1: First awareness and understanding of opportunity

Overview:

— Clarify substance and scope of the opportunity presented.

— Gain greater understanding of target customers, users and other stakeholders, their needs and aspirations.

Generic tasks:

— Distil critical aims, priority targets and distinctive factors presented by opportunity.

— Build preliminary vision of experienced reality of implemented solution.

— Formulate outline brief ("design the problem").

— Formulate preliminary business case for establishing formal project.

Inclusive design tasks:

— Undertake background research and collate comprehensive information on "inclusive design dimension" of problem (identified research, user tests, case studies, data, etc.).

— Ascertain legislation, regulations and standards to comply with.

— Identify, hold exploratory discussions with, and recommend appointment of inclusive design specialists and "expert" users.

— Identify and estimate excluded markets, as well as resource requirements of a more inclusive approach.

— Redefine new market priorities and opportunities, then develop clearer profiles of target users.

— Check against organization's inclusive design mission, objectives and master programme.

— Assess project life-span and start date.

Tools and techniques:

— Market surveys, product range reviews, competitor analyses, user observation, risk-opportunity analyses and creative thinking techniques.

Key outputs:

— Body of knowledge/reference material on market.

— Preliminary grasp of opportunity to be addressed and problems to be solved.

Stage gateway:

— Authorization of further groundwork leading to the formulation of a comprehensive project proposal with the allocation of appropriate resources.

Figure 3 — Detail relating to primary stages of inclusive design projects, Stage 1: First awareness and understanding of opportunity

Pre-project phase: Define opportunity and plan project
Stage 2: Feasibility/Clarify opportunity and prepare context

Overview:

— Check feasibility of the proposed project against available technologies, materials, user needs, market characteristics and enterprise's resources.

— Confirm viability and potential impact of project.

— Finalize project proposal.

Generic tasks:

— Test ideas on customers, users and specialists.

— Assess current products on market.

— Identify/survey key market segments/stakeholders.

— Observe potential user behaviours.

— Ascertain customer procurement procedures.

— Gain better understanding of opportunity "in the round": key outcomes, drivers of quality experiences, longer-term implications, etc.

— Formulate tangible vision of the experienced reality of the implemented solution.

— Confirm alignment with corporate identity and product brand.

— Complete evaluation of opportunity including validation with experts and target users.

— Finalize configuration of project (development strategy, team, assignment of responsibilities, resources to be committed, etc.).

Inclusive design tasks:

— Ensure all necessary inclusive design information, etc. is available to complete assessment of feasibility.

— Introduce inclusive design partners (experts and user groups) to augment project team.

— Identify inclusive design champion to promote inclusive design approach.

— Decide development strategy (tie-in with existing, or introduce separate, range/brand).

— Determine availability of people and resources for new inclusive design programme.

— Complete business case for investment in project.

— Draw up comprehensive project proposal and submit for approval.

— Agree criteria for approving solution concepts and monitoring progress/achievements.

Tools and techniques:

— Market surveys, product range reviews, competitor analyses, user observation, questionnaires and interviews, risk-opportunity and exclusion analyses, and creative thinking techniques.

Key outputs:

— Comprehensive project proposal.

— Confirmation of technical feasibility and business viability of project.

Stage gateway:

— Sanctioning of a formal project on the basis of the comprehensive project proposal submitted.

Figure 4 — Detail relating to primary stages of inclusive design projects, Stage 2: Feasibility/Clarify opportunity and prepare context

Project phase: Design and development

Stage 3: Design origination — Identify/generate options address opportunity

Overview:

— Finalize product requirements through identified user needs (and solution concepts).

— Generate appropriate options (solution concepts and strategies) to address those needs.

— Evaluate options against priorities and criteria to select the most promising to go forward.

Generic tasks:

— Ensure all necessary inclusive design information, etc. is collated to allow complete evaluation of opportunity and options.

— Decide whether existing products are to be adapted, or new products developed afresh.

— Evolve detailed map of how customers should experience implemented solution from first awareness through to final disposal, clarifying desired outcomes.

— Use imagery and physical/virtual modelling to make concepts more tangible and test.

— Simulate/rehearse/role-play use and ownership experiences to highlight "voice of customers", "moments of truth" and critical drivers.

— Create appropriate options/solution concepts.

— Test feasibility of concepts against market trends, developing technologies, timescales, resources, etc.

— Refine performance specifications.

Inclusive design tasks:

— Assign high calibre people to project and insist that a rigorous professional approach to inclusive design is maintained throughout.

— Confirm decisions on development strategy. (Single mainstream range, or a separate "inclusive" range introduced under existing brand or separate brand? See **4.12**).

— Ensure constant inclusive design strand in thinking and seek new insights into problem definition and solution.

— Validate approach and options with experts/key users; make indicated improvements.

— Use creative thinking techniques and other exercises to re-orientate staff towards inclusive design.

— Adopt appropriate inclusive design "best practices" from elsewhere.

Tools and techniques:

— User observation, creative thinking techniques, simulation, calibrated models and simulators, videos, multi-media snapshots, anthropometric and other data (for example, accident), risk and exclusion analyses.

Key outputs:

— Range of outline options.

— Rigorous evaluation criteria and procedure.

— Final design strategy.

Stage gateway:

— Select most promising option(s) for further exploration/fleshing out, highlighting specific technical/marketing problems that need resolution.

Figure 5 — Detail relating to primary stages of inclusive design projects, Stage 3: Design origination — Identify/generate options address opportunity

Project phase: Design and development

Stage 4: Design origination — Develop preferred solution concept(s)

Overview:

— Flesh out preferred option(s) into more tangible solution concepts.

— Evaluate against priorities and criteria.

— Select preferred option to be developed through to launch.

Generic tasks:

— Interpret concepts into fleshed out solutions.

— Confirm appropriate materials, technologies and processes will be available to realize the envisioned solution/support systems.

— Test options against market, financial resources, timescales and wider contexts.

— Rehearse different options to make more tangible.

— Draw out implications and anticipated impact of options.

Inclusive design tasks:

— Keep inclusive design partners closely involved throughout, validating approach and designed outputs.

— Ensure most up-to-date inclusive design knowledge/guidance is brought to bear.

— Ensure integrity of proposed inclusive solution is not compromised as work progresses.

Tools and techniques:

— User observation and trials, focus groups, creative thinking techniques, expert assessment, risk and exclusion analyses.

Key output:

— One or more tangible solution concepts with clearer knowledge of implications and anticipated impact.

Stage gateway:

— Authorization of preferred solution concept(s) for development through to launch.

Figure 6 — Detail relating to primary stages of inclusive design projects, Stage 4: Design origination — Develop preferred solution concept(s)

Project phase: Design and development
Stage 5: Design development — Detail design

Overview:

— Configure product/map out all components of total augmented product.

— Undertake detail design so components are mutually-reinforcing and result in a superior experience for users and stakeholders generally.

— Prepare designs comprehensively for manufacture and delivery.

Generic tasks:

— Rehearse customer experiences to confirm total anticipated experience remains as originally conceived; refine/debug.

— Distil critical drivers, customer "touch points"/"moments of truth".

— Confirm core and augmented product (see Figure 4).

— Develop/refine product specification.

— Prototype and test solution, perhaps through user trials (technical/market).

— Complete design of product and prepare for manufacture (working drawings, etc.).

— Finalize product delivery configuration/pricing.

— Locate implementation partners (sub-contracting, supply chain etc.).

— Establish system to protect/defend intellectual property.

Inclusive design tasks:

— Ensure most up-to-date inclusive design knowledge/guidance is applied.

— Involve inclusive design partners throughout, validating approach and outcomes.

— Ensure integrity of proposed inclusive solution is not compromised as work progresses.

— Record valuable lessons and achievements as they happen.

— Forecast how the initial product/solution concept might develop into a system/range of products and how these might be integrated into enterprise's other offerings.

— Explore branding options (use current or create separate brand?).

— Formulate preliminary implementation plan.

Tools and techniques:

— User observation and trials, interaction/empathetic/user-centred design, expert assessment, exclusion analysis, and focus groups.

Key outputs:

— Service configuration and execution plan.

— Final product pricing and delivery configuration.

— Development of proposed product (anticipated milestones/subsequent generations).

— Complete specification and development of product.

— Product fully prepared for manufacture.

Stage gateway:

— Progress to full implementation on basis that all technical challenges and inclusive design/market requirements have already, or will be, met.

Figure 7 — Detail relating to primary stages of inclusive design projects, Stage 5: Design development — Detail design

Project phase: Design and development
Stage 6: Design implementation — Realize complete product for delivery

Overview:

— Prepare organization fully to manufacture and deliver the product to market, build the necessary stocks for a market launch.

— Simplify processes, manufacturing and delivery facilities to allow disabled operatives.

Generic tasks:

— Complete specification and development of product.

— Finalize comprehensive plans for procurement, production and overall implementation.

— Prepare enterprise for new product (new perspective, standards, procedures, etc.).

— Design manufacturing/delivery facilities to allow for disabled operatives.

— Bring together and train implementation teams to bring up to speed for quality delivery; galvanize support systems.

— Construct/install new production facilities and undertake trial production runs/Debug.

— Run marketing field trials.

— Complete application of brand to product.

— Rehearse and debug delivery (perhaps through trial launch on limited basis).

— Place all supply contracts and schedule initial deliveries.

Inclusive design tasks:

— Prepare production/sales staff to handle inclusive design factors.

— Wherever possible, employ operatives from target users in teams and training.

— Confirm fulfilment of inclusive design requirements (user instructions, access arrangements, etc.).

— Finalize all specifications listing inclusive features included as standard or optional extras (on or off product).

— Formulate comprehensive launch plan.

— Institute programme to transform attitudes within enterprise/re-align the culture towards inclusive design.

Tools and techniques:

— Expert assessment, user observation, and focus groups.

Key outputs:

— Comprehensive plans for procurement, production and overall implementation.

— Confirmed satisfaction of inclusive design requirements.

— All teams ready and prepared to deliver to specification.

— Manufacture product and build up stock.

— Comprehensive launch plan.

Stage gateway:

— Gain final approval for full launch on basis of proper completion of product development as well as a comprehensive launch plan.

Figure 8 — Detail relating to primary stages of inclusive design projects, Stage 6: Design implementation — Realize complete product for delivery

Project phase: Deliver to market and support
Stage 7: Launch product

Overview:

— Launch product smoothly onto the market such that it generates favourable sales and reactions from stakeholders.

Generic tasks:

— Arrange market support/guidance on new product.

— Plan customer support and after-sales service.

— Provide special facilities or procedures to facilitate trial and purchase, as necessary.

— Ensure all promotional/customer support material, point-of-sale presentations, packaging and advertising highlight "inclusive" dimension.

— Prepare staff at head office, targeted sales outlets, and throughout supply chain.

— Put in place procedures to reveal gaps, shortcomings, rising expectations and changing market trends.

— Review immediate market response (customers, retailers, media, competitors, suppliers, specialist bodies) to launch and product.

Inclusive design tasks:

— Ensure all inclusive design requirements are met and highlighted during launch.

— Ensure pre-launch communications campaign, promotional events and material have a clear inclusive dimension.

— Publicize new product among inclusive representative bodies, agencies and networks.

— Develop more extensive network/relationship with new inclusive design sectors.

— Enhance product support system to be fully knowledgeable of inclusive design dimension.

— First evaluation of investment in inclusive design (financial, impact on design, market insight, distinctive competency and corporate reputation.

— Seek more ambitious/pioneering products to challenge newly gained expertise.

— Confirm/schedule product enhancement programme.

Tools and techniques:

— Expert assessment, user observation, interviews, market surveys, and focus groups.

Key outputs:

— Successful launch of the new product with favourable reception and sales pattern.

— Foundation for closer relationship with new inclusive market sectors.

Stage gateway:

— Record all plus and minus points and forward to design and support teams for action to consolidate new market position, exploit opportunities created, extend competitive advantage and envision development of the product.

Figure 9 — Detail relating to primary stages of inclusive design projects, Stage 7: Launch product

Project phase: Deliver to market and support

Stage 8: Sustain product in the market through improvements and updates

Overview:

— Sustain product in the market after launch.

— Introduce improvements and updates to maintain interest, enhance performance and achieve maximum market potential, in particular by reinforcing inclusive design features.

Generic tasks:

— Monitor immediate reactions of customers and media, as well as competitors' responses.

— Check way customers use the product and how they express their experiences to determine whether they are drawing full benefit.

— Debug and refine product to enhance customer experiences.

— Integrate new product into organization's range.

— Refresh/develop support systems to maintain product performance and raise customer satisfaction.

Inclusive design tasks:

— Be sensitive for triggers to refine/upgrade product offer as appropriate.

— Explore needs of potential new segments/markets.

— Envision developments of the product through a planned series of improvements, then introduce upgraded models at appropriate intervals to maintain interest and reinforce loyalty in markets.

— Distil new inclusive knowledge to apply to subsequent work/product generations.

— Develop and embed inclusive design approach within enterprise.

Tools and techniques:

— Market surveys, expert assessment, user observation, product range reviews, competitor analysis, interviews, and focus groups.

Key outputs:

— Envisioned development of product through successive models through to next generation.

— Programme of product upgrades incorporated into business plan.

— Refinements to inclusive design approach and policy.

Stage gateway:

— Gain approval to improve/update product, as appropriate, into a separate range or an integrated product system using modular inclusive design principles.

Figure 10 — Detail relating to primary stages of inclusive design projects, Stage 8: Sustain product in the market through improvements and updates

Project phase: Extract maximum value from market

Stage 9: Create range/develop integrated system of products to extend market reach over lifecycle

Overview:

— Augment product progressively into a system to lengthen its lifecycle, address a wider range of customer abilities and preferences, and capture full potential of market.

— Formulate exit strategy when product nears the end of its profitable life.

Generic tasks:

— Monitor sales patterns (repeat purchase patterns, new generations of customers, etc.), reactions of customers and media, as well as competitors' developments.

— Develop support systems, especially implementation team.

— Determine value generated by product (net contribution over lifecycle and impact on corporate reputation) plus market potential still to be exploited.

— Envision development of product through a succession of models/generations.

— Plan phase-out/final withdrawal taking account of recycling/disposal by customer, enterprise and society.

— Offer guidance/incentives for customers to upgrade to better targeted options providing superior experiences in mainstream or specialist ranges.

Inclusive design tasks:

— Monitor use of product by key customers and act on feedback.

— Monitor acceptance and image of inclusive products. Review design strategy and business case on suitability to amalgamate ranges.

— Explore needs of potential new segments/markets.

— Be sensitive for triggers to upgrade/develop product.

— Distil new inclusive design knowledge to apply to subsequent work/product generations.

— Progress to range extension and successive generation products.

— Develop system of fully co-ordinated, seamlessly delivered products.

— Re-engineer and recycle the product under license or a new brand.

Tools and techniques:

— Market surveys, expert assessment, user observation, product range reviews, competitor and risk analyses, interviews, and focus groups.

Key outputs:

— Planned route to subsequent generations of the product/system.

— Collation of inclusive expertise accumulated within organization.

— Introduction of a succession of models or extensions to product/system.

— Formulation of an exit strategy for product.

Stage gateway:

— Gain approval for extensions to range and successive generations of product, as well as the exit strategy.

Figure 11 — Detail relating to primary stages of inclusive design projects, Stage 9: Create range/develop integrated system of products to extend market reach over lifecycle

Project phase: Extract maximum value from market
Stage 10: Withdraw product from market

Overview:

— Phase out then withdraw product from market, at a financially judicious point, in such a way as to retain goodwill and reflect well on the enterprise.

Generic tasks:

— Monitor reactions of customers, competitors and media.

— Review exploitation of market potential and value generation of product.

— Withdraw product ensuring that necessary support for customers is maintained for an appropriate period after withdrawal.

— Ensure proper recycling and/or disposal of products.

— Sustain aspects of the product and existing customer base after withdrawal.

— Review impact on corporate reputation.

Inclusive design tasks:

— Ensure full account taken of inclusive design customers/users.

— Explore potential new roles of enterprise in serving inclusive markets.

— Distil new inclusive knowledge to apply to subsequent work.

— Ensure withdrawal does not damage corporate reputation, especially with regard to older and disabled customers.

Tools and techniques:

— Market surveys, expert assessment, user observation and verification of user data, questionnaires, interviews, and focus groups.

Key output:

— Smooth and clean withdrawal from market.

Stage gateway:

— Commission overall review of project, product and organization's overall inclusive design approach.

Figure 12 — Detail relating to primary stages of inclusive design projects, Stage 10: Withdraw product from market

Post-project phase: Build effectively on whole experience

Stage 11: Lifetime review of project and product experience, and overall inclusive design approach

Overview:

— Carry out comprehensive reviews of the product, project and overall inclusive design approach to evaluate performance and distil lessons.

— Build effectively on new knowledge and experience gained to extract maximum benefit.

Generic tasks:

— Archive information to enhance value.

— Encourage formulation of project proposals taking account of review/lessons.

— Publicise achievements to enhance corporate reputation.

— Incorporate new knowledge into core data on which enterprise operates.

— Introduce new knowledge into staff/executive development programmes.

Inclusive design tasks:

— Distil lessons relating to inclusive design/project management practices, and for future product generations.

— Prepare project review report recommending how inclusive design policy and practices might be upgraded and philosophy embedded more firmly within the enterprise.

— Record the benefits derived from inclusive design, highlighting opportunities, achievements and added value that would not otherwise have occurred.

— Monitor change in corporate reputation/image resulting from embracing inclusive design.

— Refine and embed inclusive design philosophy, strategy and practices within the enterprise.

— Archive inclusive design knowledge/experience and make widely accessible within the enterprise.

Tools and techniques:

— Creative thinking techniques, market surveys, expert assessment, user observation, questionnaires, interviews, and focus groups.

Key outputs:

— Comprehensive determination of added value created.

— Legacy of distinctive experience passed to successors and incorporated into knowledge base of enterprise.

— Action plan with new investment opportunities based on lessons learnt from experience.

— Positive impact on corporate reputation.

— Upgraded inclusive design policy.

Stage gateway:

— Approval for new investment opportunities to sustain competitive advantage and help develop inclusive design into a distinctive competency of the organization, and for leadership in inclusive design to become a core characteristic of its corporate reputation.

Figure 13 — Detail relating to primary stages of inclusive design projects, Stage 11: Lifetime review of project and product experience, and overall inclusive design approach

5.4 Summary checklist of basics of effective inclusive design management (project level)

Effective management of inclusive design at project level can be outlined as follows:

a) Build up an in-depth understanding of key issues and facts through an involvement with an internal Change Team, by developing appropriate knowledge and skills, establishing a collection of thorough reference material and other design tools, developing a network of contacts in various organizations, and so on.

b) Encourage active links, collaboration and alliances with disability and older adult groups and centres, future trends researchers in academe and consultancy to identify needs and provide feedback on new design directions.

c) Use knowledge of demographic and social change to identify opportunities for innovation when developing products that match the changing consumer and legislative framework.

d) Learn from best practices elsewhere and develop own practices accordingly.

e) Ensure all participants (especially project leaders) understand, and are committed to, inclusive design principles, and acknowledge their "inclusive" responsibilities.

f) Establish a project management system that addresses inclusive design principles from the start.

g) Insist that all proposals for initiatives include clear inclusive design requirements; unless some factor is specifically excluded, assume it is included.

h) Ensure holistic inclusive approach throughout supply/value chain.

i) Involve appropriately experienced people (users and other partners) at all critical stages (such as the design process, evaluation and testing) and ensure all teams have access to inclusive design expertise.

j) Experiment with simple research methods that deliver quick insights into user issues and build empathy with older and disabled consumers.

k) Ensure that all areas where there is the possibility of exclusion can be identified.

l) Set inclusive design criteria for all project reviews.

m) Capture all relevant experiences as they happen and ensure that documented experience is shared across organization and passed on from project to project for all to benefit.

n) Take responsibility for continuing professional development of executives and staff; promote opportunities through conferences, training courses and workshops.

Annex A
The challenge of leading inclusivity in business

A.1 Understanding market change

A.1.1 *Demographic change*

Reductions in infant mortality, low birth rates and increasing longevity are significantly restructuring population across the developed world. In the UK, the average consumer is ageing rapidly: by 2020, half of adults will be aged 50 or over. The recent fall in the number of younger consumers will continue unless birthrates rise again or immigration is encouraged. The United Nations estimates that the number of 65 to 84 year-olds across the globe will increase from 400 million to 1.3 billion by 2050. These trends are unlikely to be reversed in the foreseeable future. Figure A.1 illustrates trends in the UK population by age.

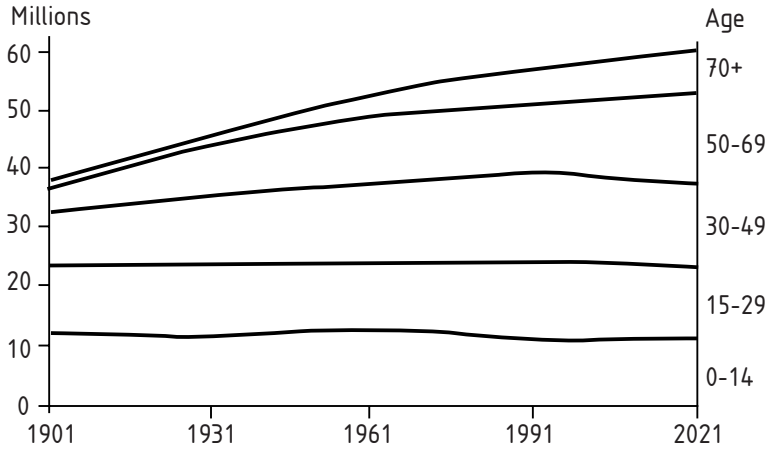


Figure A.1 — UK population by age

It is increasingly recognized that we can be fit and active well into old age, though levels of disability rise significantly with age and have an impact on lifestyle.

Older consumers are changing in their behaviour and expectations. People in their forties to sixties are challenging the previously accepted meaning of the term "middle-aged" through the ways they choose to live their longer lives.

Collectively, older people have 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, and help to sustain a healthy economy. The business community has been slow in responding to this fundamental restructuring of the marketplace. The design challenge is to enable older people to cope with, respond to and take up the opportunities of a changing society, ideally fulfilling their needs through mainstream products and services.

A.1.2 *Legislative change*

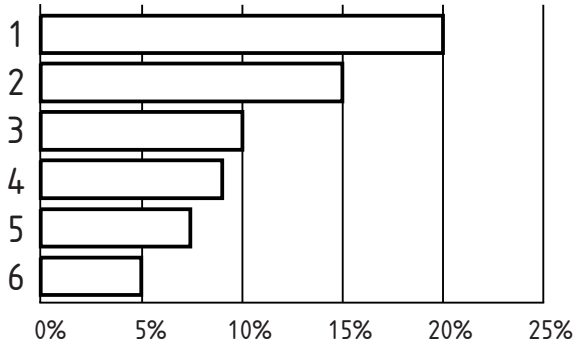
Recent laws and regulatory changes have significantly advanced the rights of disabled people in the UK. The Disability Discrimination Act (DDA) [1] was passed in 1995 and came fully into force in October 2004. A 2002 EU directive on countering age discrimination will lead to UK legislation in 2006. Equivalent laws and regulations in the USA, Australia and many other countries also influence international markets. BS 8300 and Part M of The Building (Amendment) Regulations 2004 [2] are important references relating to the design of buildings and their approaches to meet the needs of disabled people. Failure to take "reasonable" steps to counter discrimination could leave a company exposed to litigation and financial liability. A clear, inclusive mission statement and design management strategy will go a long way to protect against litigation, strengthen brand values and enhance consumer loyalty.

A.2 Understanding consumers

A.2.1 *Special needs*

Understanding the needs and aspirations of more extreme groups of consumers results in better quality designs that increase usability for the broader population and are more likely to address important lifestyle issues that drive consumer choice. This can lead to significant innovations in design and communications, give businesses access to expanded markets, raise levels of customer satisfaction, and protect against future liabilities under anti-discrimination legislation.

Many people have ill-founded, stereotypical views of what diverse people are like, what they do with their lives, their intelligence, energy and competencies, as well as how they view and use products. In a business or public service, these often reduce the quality of what is on offer, and might even alienate significant consumer groups. A further consequence is that the design of mainstream products often ignores the needs of significant sectors of the population. The following figures are indicative of the order of magnitude of such groups within the UK. Figure A.2 illustrates some people with special needs in the UK as a percentage of the population. Reliable statistics are difficult to obtain for other groups: for example, people with allergies and those sensitive to electromagnetic radiation.



Key

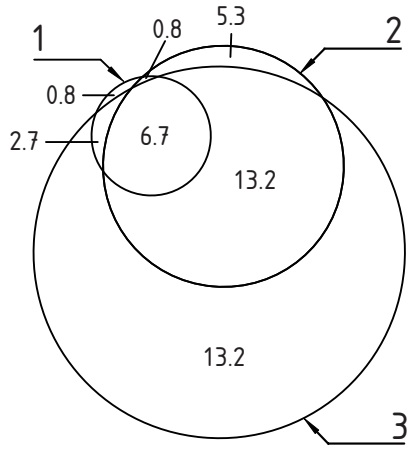
1. Children under 16
2. Older people over 65
3. People with disabilities
4. Left-handed
5. Males with red/green colour blindness
6. Primary language not English

Figure A.2 — People with special needs in the UK (approximate % of population)

A.2.2 *Disabled consumers*

Significant segments of the population display some reduction in capabilities. The results of the Disability Follow-up to the 1996/97 Family Resources Survey [3] revealed that some 20 % of the adult population is disabled according to the definition used: 34 % of these have mild conditions, 45 % moderate and 21 % severe conditions.

Figure A.3 illustrates prevalence of single and multiple capability loss as a proportion of UK population aged 65 and over.



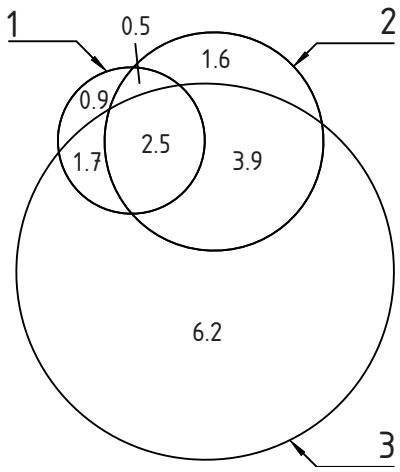
Key

1. Cognitive
2. Sensory
3. Motion

Figure A.3 — Single and multiple capability loss — Prevalence of capabilities (% of UK 65+ population)

The large majority of disabled consumers are aged 60 or over. They tend to have multiple minor impairments, which in combination, can have a significant impact on their quality of life. The most important issues for them are independence and respect; these, in turn, are likely to influence spending behaviour.

Younger disabled people, though not as numerous, are increasingly visible. They could have a significant impact on brand reputation if businesses disregard their needs and aspirations. Figure A.4 illustrates single and multiple capability loss as a percentage of the UK population aged 16 years and over.



Key

1. Cognitive
2. Sensory
3. Motion

Figure A.4 — Single and multiple capability loss — prevalence of capabilities (% of UK 16+ population)

A.2.3 *Accessible design*

It is important to underline that inclusive design is rarely "design for all" in the sense that one product meets the needs of the whole population. Typically, that is achieved through a range of products or the potential for customisation built into products. Even then, there are likely to be individuals who will require considerable personalisation of products, or the assistance of a carer. Incremental product improvement might go some way towards increasing accessibility, and be a desirable and less costly first step on the journey towards inclusivity.

A.2.4 *Temporary impairment*

Organizations need to address the challenges presented by temporary impairment arising from pregnancy, illness or injury, such as a broken leg. Slight or severe problems can fluctuate over time, particularly among older people, as the body deteriorates through age.

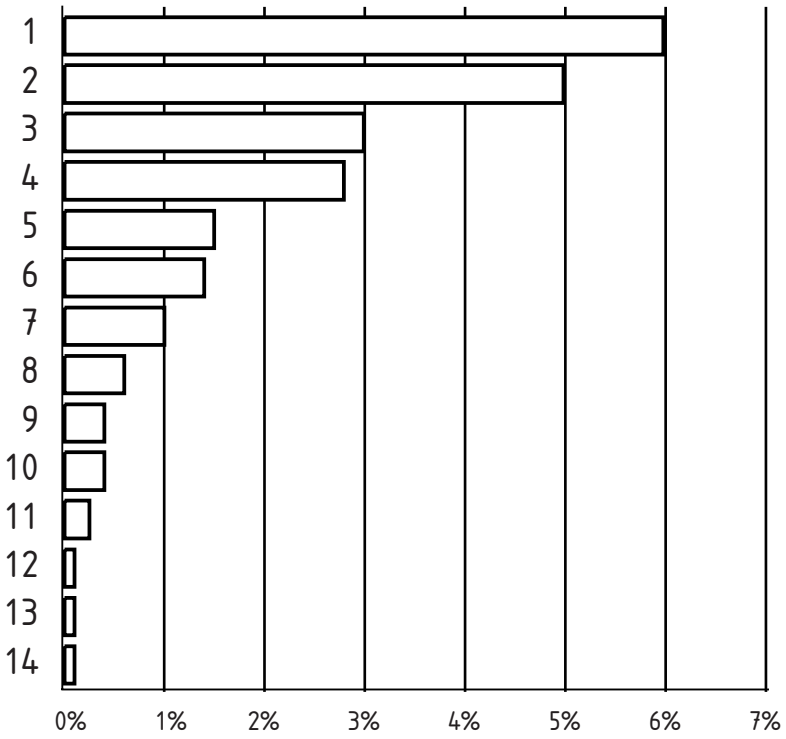
The needs and abilities of people change as they advance from childhood to old age; they also vary substantially within an age group. Functional and cognitive limitations can vary from the comparatively minor (such as mild hearing loss or use of spectacles for reading), to blindness, deafness and the inability to move part or all of one's body.

A.2.5 *Multiple impairments*

Minor limitations can pose significant difficulties when they occur in combination. Therefore all those involved in product and service development need to be aware of the many factors that affect the use of a product, service or environment by people with different levels of ability. Hearing, vision and mobility impairments tend to occur concurrently, particularly among older people. However best estimates for separate user groups should not be aggregated. Group sizes tend to be estimated conservatively, and very much larger numbers would be obtained if lower levels of impairment were included. For example, over half of the population needs some form of optical correction, and about one sixth has a clinically significant hearing loss.

A.2.6 *Information and communications technology (ICT)*

The significant impact of impairments, especially multiple impairments, on design can be illustrated by the rapid growth in use of ICT systems, and the groups of people likely to experience difficulty in using them. Lower levels of impairment will not normally lead to difficulties when using ICT systems, but could cause problems in adverse circumstances, particularly when combined with other minor impairments. Therefore it is imperative to make a product-specific assessment in each case. Figure A.5 illustrates percentage of UK population likely to experience problems using IT.



Key

1.	Hard of hearing	8.	Language impaired
2.	Cannot walk without aid	9.	Blind
3.	Intellectually impaired	10.	Wheelchair users
4.	Reduced strength	11.	Speech impaired
5.	Low vision	12.	Cannot use fingers
6.	Reduced co-ordination	13.	Cannot use one arm
7.	Dyslexic	14.	Deaf

Figure A.5 — People likely to experience problems using IT as a percentage of UK population

A.3 Workforce issues

The DDA and other UK and EU legislation, places obligations on employers to make workplaces age- and ability-friendly, and offer wider opportunities for training.

In future, people are likely to work longer and retire later. Several major companies have demonstrated that benefits can flow from employing older and disabled workers. Such employees are less likely to take sick leave than their younger colleagues, and are more likely to welcome part-time and variable working hours. For retailers in particular, accommodating a more diverse workforce (in terms of age and capability) is likely to lead to improvements in the treatment of customers, as well as the design of sales environments, that will benefit a wider spectrum of customers.

Companies that introduce greater flexibility in employment allow a closer match between working hours and customer/production demand. They also offer employees with opportunities to supplement their pensions and maintain an adequate income beyond the age of formal retirement. The costs of long-term absence and early retirement for medical reasons can be reduced significantly through improved work environments. Moreover, an inclusive strategy can shape relations with local communities and advance corporate social responsibility.

Annex B
Tools and techniques for managing inclusive design

B.1 General

This annex provides an overview of selected tools, techniques and models for managing and implementing inclusive design grouped according to clusters of activity they support during design development. These can be applied in both small-scale short projects and large, longer-term projects.

NOTE The selection is only indicative, not exhaustive.

Designers and design leaders will find some more useful than others. They are encouraged to develop their own approaches and techniques according to market sectors, scale of operation and other particular circumstances. In all cases, it is essential that methods are adopted on an informed basis for, unless care is taken with their use and the end-users targeted, there is no certainty that these methods will deliver inclusive results.

The Bibliography (and websites listed therein) are a good starting point for consulting the considerable literature now available on these tools and techniques.

B.2 Defining goals

B.2.1 *General*

Understanding the market opportunity an organization wishes to address involves identifying potential users, product ranges, and products currently offered in the selected market.

B.2.2 *Market surveys*

Market surveys take many forms. In every case, the prime aim ought to be to determine:

a) the scope for an organization to extend or consolidate its position within its current market(s) and the suitability of entering new markets;

b) the best strategies in all instances.

B.2.3 *Product range reviews*

Product range reviews serve essentially the same purpose as market surveys though they tend to focus on the organization's own product range and the potential for modification, extension or updating. They can also be undertaken as a form of audit for example, to ascertain the usability or suitability of the products for a range of users of differing capabilities.

B.2.4 *Competitor analyses*

Competitor analyses are product range reviews that focus on the products offered by competitors. These can be further developed to include direct comparisons between an organization's products and those of competitors to identify relative strengths, weaknesses as well as gaps in all ranges and opportunities to improve usability.

B.2.5 *Risk-opportunity analyses*

Risk-opportunity analyses involve identifying the costs and benefits of pursuing, or not pursuing, particular lines of action, taking due account of obligations under legislation such as the Disability Discrimination Act, 1995 [1]. Thus identifiable additional costs of adopting more inclusive practices might be compared with the benefits from an anticipated expansion in customer-base, avoidance of litigation and damage to corporate reputation.

B.2.6 *Creative thinking techniques*

creative thinking techniques, such as brainstorming, can help to identify and explore potential markets. They can also bring out opportunities to improve products, particularly in facilitating their use and how they might be made more attractive to customers.

NOTE More detail on this technique is set out in BS 7000-1.

B.3 Getting to know your users

B.3.1 *General*

One of the most common causes of design exclusion is that designers are not aware of the full range of potential users. It is essential to remind designers/team members regularly that not all users are young and able-bodied or, indeed, like themselves. Similar problems occur in relation to marketing, advertising and after-sales support.

The following techniques help to gain a better understanding of, and more detailed information on, all users in targeted market sectors relating to inclusive design not least by involving users with a range of capabilities, experiences and knowledge.

B.3.2 *Questionnaires*

Questionnaires can provide information on users' perceptions: primarily in the form of subjective feedback about what users think of something though this might not accurately reflect their actual experiences. Questionnaires should be accessible (alternative formats might be required). They should include questions on ease of use (typically set out with scaling techniques (e.g. Likert) together with questions on capability demands made on users by the product. For example, "How do you rate the stiffness of the lid?"

B.3.3 *Focus groups*

Focus groups involve moderated discussions among a group of carefully selected users. This is an effective method to identify perceptions, but rarely provides objective data or measures. Focus groups can gain their own momentum and produce much useful information. However, unless carefully moderated, they can be dominated by forceful participants or diverted from the set topic.

B.3.4 *Interviews*

Interviews serve a similar purpose to focus groups, though on a one-to-one basis between interviewer and respondent. These are easier than focus groups for interviewers to handle and keep focused, however the same momentum might not be generated.

B.3.5 *User observations*

User observations are a highly effective way of identifying user difficulties with products. Carefully selected users are required to follow specific a protocol. This allows direct comparison between users and between products. The data gathered are predominantly objective.

B.4 Structuring and presenting user data

B.4.1 *General*

It is important for the information distilled from user data collection to be presented in formats that are accessible to all project team members. The same information might need to be presented in different formats to designers, management, marketing and sales, and other key audiences. Information might also need to be provided in summary or predominantly graphic as well as in more detailed and specialist formats (particularly when professional researchers are involved). The central issue is that properly informed decisions can be taken at all stages and not undermined later because key data are overlooked or misunderstood by team members.

B.4.2 *Simulation*

Simulators attempt to replicate or emulate physical impairments. Designers use them to gain direct experience of difficulties encountered by users. Examples include wearing spectacles with obscuring lenses to simulate visual deficiencies, and earplugs to simulate loss of hearing. Simulators are most useful when considering physical access issues, but are limited when addressing cognitive impairments or difficulties: these are not so well understood and, more significantly, cannot be imposed externally in an ethical manner.

B.4.3 *Calibrated simulator*

Simulators can be calibrated according to commonly accepted functional capability scales. Where those scales have also been used to analyse the prevalence of capability losses – for example, in the Disability Follow-up to the 1996/97 Family Resources Survey [3] by the Office of National Statistics – the calibrated simulator can also be related directly to real numbers of target users (that is, "this" particular combination of capability losses are experienced by "that" many people; see **A.2.2**).

B.4.4 *Calibrated model*

Designers often develop a model as a synthetic version of target users with specific impairments. They then observe how that model performs tasks under consideration. This is common practice in Information Technology. Virtually all such models are currently software based however, as technology improves especially in the field of robotics, hardware simulations are becoming increasingly viable.

B.4.5 *Videos*

Short videos of target users, perhaps depicting their lifestyles or using or talking about particular products, provide designers with valuable insights into the needs and aspirations of users. Such dynamic illustrations can be effective in inspiring designers to formulate inclusive solutions.

B.4.6 *Multimedia snapshots, scenarios and storytelling*

Multimedia snapshots supplement imagery – illustrations, photographs and videos relating to targeted users, their needs, aspirations and use of products – with short textual descriptions and other complementary information. This is often presented in the form of text-based stories, scenarios or storyboards representing different users interacting with a particular product or service.

Such accounts offer immediate means of assessing a variety of ways and situations in which a product/service will be accessed and used. These are also powerful for compiling user profiles based on actual user data or amalgams of individual users to represent the full range of target users and contexts of use.

B.4.7 *Anthropometric and other data, charts and reference tables*

Anthropometric or accident data, and data gathered from **B.3** can be encapsulated using graphs, charts and tables. These can be effective for revealing trends and relative values, and for communicating more vividly what could be perceived as overly dry information in designer-friendly formats. Reference tables and other conventional data formats are particularly suited to showing absolute values, however designers might not readily understand or be inspired by them.

B.5 Verifying user data

Accurate user data are essential in all user-centred, or user-sensitive, design approaches. Therefore, such data should be checked against target user populations.

The following approaches can be adopted:

a) apply a different technique on the same sample of users selected for the analyses in **B.3** to check whether their responses are consistent;

b) apply the same techniques to a different sample drawn from targeted users.

B.6 Utilising data to design inclusively

B.6.1 *General*

If the data obtained from **B.3** is presented well, then competent designers should be able to address the new requirements with only slight modifications to their design practices. In that sense, inclusive design intrudes minimally.

B.6.2 *Involving users*

Involving users throughout the design process provides rapid, detailed feedback on sources of potential difficulty for users, often revealing richer insights that lead to fresh solutions. This is particularly effective for project team members/designers who are unfamiliar with the extremes of the user population. However, care is required when selecting the sample users to be involved.

B.6.3 *Interaction design*

Interaction design focuses on identifying user goals and the steps users are most likely to take to achieve those goals, then structures interactions to match them closely. This approach is a development of human-computer interaction design practice and offers two potential benefits:

a) by highlighting the steps that are essential to complete a task, it highlights unnecessary steps and barriers that can then be removed;

b) users' idiosyncratic patterns of use, evolved as a result of their impairments ("coping strategies"), are recognised and can be supported through the design process.

B.6.4 *Empathic design*

Empathic design involves encouraging designers to learn more about the needs, wants and aspirations of target users. This is often achieved through extended exposure to target users so designers are better able to address their requirements effectively. For inclusive design, empathy is likely when representatives from specific target user groups are involved.

B.6.5 *User-centred design (UCD) methods*

Many techniques from user-centred design can be adapted for inclusive design. The principal requirement is to ensure that the definitions of the users adopted at the outset of the design process explicitly recognize users with different functional capabilities.

B.7 Assessing and verifying products

B.7.1 *General*

It is necessary to assess and verify a product iteratively at all stages of the design process to identify sources of exclusion as early as possible, when they are comparatively straightforward to rectify at low cost. A formal procedure should be adopted to verify completed designs. Combining several tools and techniques will provide more-rounded data.

The same criteria and attention should be applied to packaging, advertising, marketing, education/training, customer service and other factors in the supply chain to ensure that a product's inclusivity is not compromised or undermined when delivered to market.

B.7.2 *Expert assessment*

Experts in inclusive design can be asked to provide rapid assessments of products, primarily focusing on functional acceptability. This approach is useful for organizations with limited budgets or time constraints. However, effectiveness depends on the competencies of the experts employed.

B.7.3 *Exclusion analyses*

An exclusion analysis involves the systematic assessment of the capability demands of interacting with a product. By comparing the capability demands with population capability data, it is possible to determine, either by experts or using calibrated simulators, the proportion of people who would not be able to use the product. Exclusion analyses focus primarily on functional acceptability.

B.7.4 *User observation*

User observation is the preferred choice of many professionals for determining whether a product is acceptable or not. User observations can provide data for both functional and social acceptability. It can take many forms: open (such as shadowing), and secret (e.g. from behind one-way mirrors or through the use of video recording). Other methods involve user clinics and panels. Important ethical issues relating to the use of images and other information captured arise whenever research involves members of the public, especially people who might not be able to give informed consent.

B.7.5 *User trials*

User trials are the generic means of analysing users interacting with products. There are two principal types of user trial: observed (see **B.7.4**) and unobserved. Typically, the latter involves recruiting a greater number of users to use products in the environment they were designed for (for example, kettles would be used at home). Feedback is obtained through interviews, questionnaires and focus groups "after the event". User trials can provide data for both functional and social acceptability.

B.8 Validating in use

After a product has been delivered to users, it is necessary to sustain and augment the product in the market through design improvements and updates. The tools and techniques used for this are the same as for defining goals. Results can form the basis for enhancing an existing range and for initiating the development of a new generation of products.

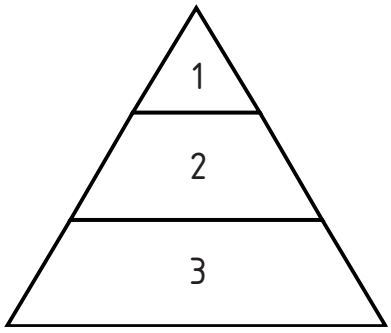
B.9 Models of user capabilities and requirements

B.9.1 *General*

The models described in **B.9.2**, **B.9.3** and **B.9.4** help designers visualize the target populations for products, services and systems. They also help to identify and quantify, where possible, important user factors that need to be considered.

B.9.2 *User pyramid*

The user pyramid is a simple graphical representation of the targeted population, with the most able users at the bottom of the pyramid and the least able at the top. This reminds designers that the population is not uniform. Such pyramids also chart the inclusivity of a new product or an existing product as it is developed through its lifecycle. Figure B.1 illustrates a user pyramid.



Key

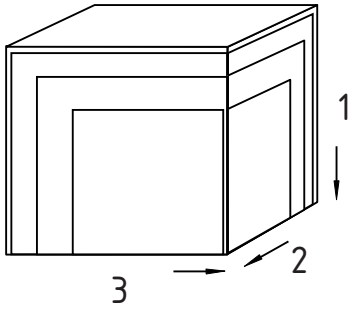
1. Disabled
2. Reduced capability
3. Fully capable

Figure B.1 — User pyramid

B.9.3 *Inclusive design cube*

The inclusive design cube (similar in concept to the user pyramid) complements the 7-level model (see **B.9.4**). The whole population is represented as a cube, whose axes represent increasing perceptual, cognitive and motor capabilities corresponding to levels 3 to 5 of the 7-level model. This provides an immediate visual representation of the capability demanded by the product and its inclusivity of the product.

Figure B.2 illustrates an inclusive design cube. In this example, a user-aware product (the darker cube) meets the needs of some, but not all, of the population. By adding adaptability or the possibility of customisation, a larger population is accommodated. Special designs or interfaces might be necessary when including those with significantly reduced capabilities. Finally, those who require personal assistance might further challenge the design of a product, system or service.



Key

1. User motor function
2. User cognition
3. User perception

Figure B.2 — Inclusive design cube

B.9.4 *7-level model for countering design exclusion*

Developed specifically for the inclusive design of complex products and systems, such as those incorporating information technology (say, a smart home system), this 7-level model helps ensure that the final design:

— can be accessed by a wide range of users;

— meets users' expectations and other social requirements in ways that mean they are happy to use the product or system and do not feel excluded or stigmatised by it.

This model includes the following levels:

— *Level 1: Identifying user wants and aspirations*. Defining then verifying the complete problem, including social acceptability requirements.

— *Level 2: Determining user needs*. Specifying the functionality to be provided then verifying the functional specification.

— *Level 3: Facilitating user perceptions*. Introducing appropriate output/feedback mechanisms, then verifying that users can "perceive" (see, hear, etc.) the output from the product.

— *Level 4: Ensuring users understand how to use the product*. Structuring interactions that match user expectations of how the product should behave, then verifying that users understand the product's behaviour.

— *Level 5: Ensuring users can interact physically with the product*. Developing quality of control and user input, then verifying that the users can control the product without undue physical discomfort.

— *Level 6: Verifying that the product does what is intended*. Evaluating the total product's functionality, usability and accessibility, then validating its practical acceptability.

— *Level 7: Confirming that users are happy with the product*. Evaluating match with user requirements then validating social acceptability.

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Useful websites

www.cae.org.uk The Centre for Accessible Environments.

www.cdc.gov/nchs/nhis.htm UK National Health Survey.

www.designcouncil.org.uk The Design Council.

www.design.ncsu.edu/cud/pubs/center/pubslist.htm#eval Center for Universal Design, USA.

www.dptac.gov.uk Disabled Persons Transport Advisory Committee.

www.drc.org.uk Disability Rights Commission.

www.dti.gsi.gov.co.uk/ccp/topics/safety.htm UK Department of Trade and Industry — information on UK safety legislation applicable to products, including the revised General Product Safety Directive (2001/95/EC).

www.employers-forum.co.uk UK Employers Forum on Disability – disability in the workplace.

www.ergonomics.org.uk The Ergonomics Society – professional society for ergonomists and human factors specialists.

www.etsi.org European Telecommunications Standards Institute.

www.hhrc.rca.ac.uk Helen Hamlyn Research Centre, Royal College of Art, London.

www.ricability.org.uk Consumer research and product evaluation, in particular with regard to older and disabled people.

www.rnib.org.uk Royal National Institute of the Blind.

www.rnid.org.uk Royal National Institute for Deaf People.

www.tiresias.org An information resource for professionals who work in the field of visual disabilities.

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