

How Inclusively Designed Mainstream Products Can Lead to Fresh Thinking in Home Adaptation

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Abstract. Traditionally assistive technology or environmental intervention introduced to help with independence in the home has tended to look ‘medical’ or ‘institutional’, focussing on function rather than aesthetic considerations and overlooking the aspirations of the householder. This paper describes a recent social housing project where the interior design of two newly built houses in Bradford, UK, for Habinteg Housing Association, were used to demonstrate that it is possible to balance form and function when designing to enhance independence in the home. The Bradford project builds on previous research in this area by the author and refers to the paper ‘Home Improvement for Independent Living’ (Pearce 2003). The initial research was in turn inspired by the construction of the first Lifetime Homes in Hull in 1994 by the Joseph Rowntree Foundation, in collaboration with Habinteg Housing Association.

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1 Background

1.1 Lifetime Home Concept

The Lifetime Home concept originally identified 9 ways in which new housing design could be made more accessible and adaptable in order to suit a wide range of householders. However, the criteria tended to concentrate on the architectural fabric of buildings, such as wider doorways, level access thresholds, wider corridors and lower height window sill heights. Fitted furniture, such as in the bathroom and kitchen, tended to be of standard design, with traditional ‘institutional’ looking adaptations still being required to make the bathroom more accessible, such as grab rails and plastic seat extensions on the toilet.

Since its conception the Lifetime Home criteria have now expanded to 16 items of accessibility for the homes. Supporters of the concept tried unsuccessfully to have the criteria enshrined within the UK Building Regulations. The aim of the Bradford project was to inject fresh-thinking into the Lifetime Homes concept and demonstrate to the construction industry that inclusive design benefits not only the householder, but makes commercial sense, by widening both the usability and marketability of properties whether it be in the social or private housing sector.

The limitations of interior design as first observed in 1994 in the Lifetime Homes, became the focus of a two year research project by the author 'Home Improvement for Independent Living' [4] which aimed to extend the accessible thinking to the whole interior.

1.2 Home Improvement for Independent Living (1998 – 2000)

The 'Home Improvement for Independent Living' research, carried out through the Helen Hamlyn Research Centre, London, aimed to demonstrate that, by careful selection of mainstream home products with inclusively designed features, the interior of any property could be made more accessible, without compromising either functionality or the interior aesthetics. The aim being to satisfy the functional needs of the householder, whilst addressing their psychological needs and aspirations for their home.

In 2005 as a direct result of the earlier research Habinteg Housing Association challenged the author to re-design the interiors of two of their Bradford properties, as a way of testing the research design assumptions and of furthering the remit of the Lifetime Home concept to include the interior fit-out of the kitchens and bathrooms.

The original research had explored how older people change the interiors of their own homes to match their own changing needs and abilities. The methodology included initial focus groups, which highlighted kitchen and bathroom design as being key issues to remaining independent at home. Through further analysis of personal interviews and observation, combined with a design survey of each of the 20 properties, the following common age related limitations were identified:

1. Reduced ability to bend & stretch i.e. rising from the bath or reaching into high or low kitchen storage cupboards
2. Reduced hand and wrist dexterity i.e. turning stiff cross-head taps and control knobs, grasping door knobs
3. Safety i.e. slipping in the bathroom, tripping hazards, leaving the gas on and danger of scalding from hot water in the kitchen and bathroom
4. Reduced vision i.e. reading appliance controls, glare and general lighting levels

Supported by an extensive product and literature search, the research went on to identify suitable mainstream household products, with inclusive design features which addressed and resolved the above issues. The products were combined in careful ways which further addressed the identified problems, such as wall-mounted bathroom sanitary ware products, which can be fixed at a height to suit the user countering physical difficulties for people who experience difficulty rising from the toilet and avoiding the psychological stigma of having to use an unsightly plastic toilet seat riser. This design solution also suits many taller people. In order to achieve the new height it was, at first necessary to fix the toilet brackets to a raised floor joist. However, following discussions with a major UK bathroom manufacturer, it was agreed to drill extra holes in the toilet brackets, to accommodate a raised-height, a tangible inclusive design outcome to the research.



Fig. 1. Left shows a toilet raised on a bracket **Fig. 2.** Right shows a plastic toilet seat riser

1.3 Learning Outcomes

The research also highlighted a clear pathway for delivering information to older consumers, to encourage them to be proactive about re-designing their homes in a way which will underpin their own personal independence. It was clear that when feeding-back the research findings to the householders who took part, there was a resistance to the design solutions suggested for their own situation, which were seen as in some way challenging their ability to manage their own independence. Yet, when design solutions relating to other people's homes were shared, the information was received with interest and the designs were seen as potentially appropriate to the viewer's own situation, a form of self-determination using visualization techniques. One conclusion of this research was that 'story-telling' combined with visualization techniques are valuable tools for encouraging an autonomous and proactive response without the need for prescriptive design intervention.

2 Inclusive Design Methodology

The aim of inclusive design is the involvement of people in the design process, with emphasis not only on testing with users, but also designing with social factors such as demographic change [1]. The Bradford Project, mentioned earlier, aimed to test the design assumptions and research conclusions by creating real images (rather than an artist's impression as used in the research) of future-proof [4] designs as a visualization tool to share with older consumers and housing professionals such as occupational therapists.

At the outset of the project, due to commercial constraints on time, it was decided to construct full-scale room-sets of the kitchen and bathroom designs in a 3000 sq ft warehouse, for use as a 'Methods Lab' to enable user testing to take place by different users, including those using wheelchairs. The testing the designs were adjusted and further refined and the process filmed and photographed for further evaluation, before the room-sets were dismantled and the products transferred to site for fit-out.

The methodology used on the Bradford project was a combination of product selection, using inclusive design values and user testing of the resulting designs, for functionality and aesthetic appeal. The project was unique in that it pulled together, in

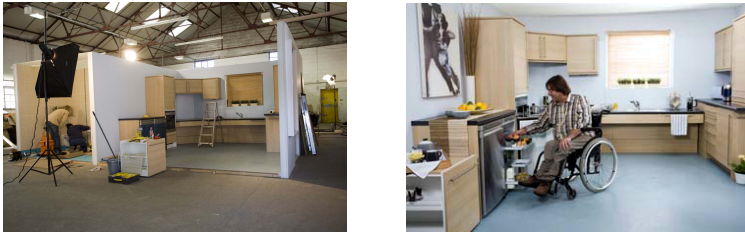


Fig. 3. A 'Methods Lab' was constructed to test the 'inclusive' designs prior to fit-out on site

an interior design setting; many examples of inclusively designed products not normally assembled in such a manner to demonstrate the wide number of inclusive products which already exist in the mainstream but which are 'invisible'. For example, the bathroom products in one of the four bathrooms were donated by a single manufacturer, but the products were selected from not one, but from across eight different ranges within the manufacturer's portfolio to achieve the desired aim of full inclusivity, not a process which would be easily achieved by other housing professionals or consumers themselves. It was the first time this manufacturer had experienced such a project and it demonstrated inclusive design could be a new marketing opportunity. In his book 'The 50+ Market' Dick Stroud comments, 'Arguably the issues in this book (the burgeoning 50+ marketplace) and their business consequences are of greater significance than e-business.' [6] He goes on to say, 'It is not hyperbole to claim that any company that doesn't consider this issue is risking its share-holders' interests.'

Industry uptake is now the single most important aspect of inclusive design development, and will no doubt become the future measure of success [3]. For this reason the relationships forged with the 26 UK manufacturers, who were approached by the author to collaborate on the project, were considered essential, if the project was to succeed in encouraging manufacturers to design more inclusively.

Inclusion needs to be strongly represented during the prioritization of time, money and quality [5]. On site, Bradford provided a unique opportunity to identify and work alongside the various stakeholders in the process of creating a large scale inclusive design project. In doing so, it highlighted their individual requirements and priorities, which have to be addressed and communicated within the inclusive design agenda, if inclusive design is to remain a priority throughout the project. The stakeholders identified were:

1. Client
2. Architect
3. Maintenance Contractor
4. Building Contractor
5. Trades
6. Trade Suppliers
7. Manufacturers
8. Occupational Therapists
9. Householder

To support inclusive design it is necessary to understand the knowledge requirements of designers and design commissioners, both in terms of content and format [2]. Working closely with the stakeholders from the design stage of the project, through to completion and ultimately hand-over of the property to the householder, highlighted how the communication of inclusive design has to be able to be translated into different ‘languages’ and methodologies (verbal, written and diagrammatic), in order for the key ‘inclusive’ design principles to survive alongside traditional and entrenched working practises, such as those in the construction industry. For example, wall-mounted frame toilets, which allow the toilet pan to be hung at different heights to suit the user, are more commonly used in commercial, rather than residential projects, and it was determined from the Project, require a far more detailed level of fitting instructions for an uninitiated plumber, than those currently provided by the manufacturer. This information was then communicated back to the collaborating manufacturer as part of the evaluation process.

The reticence of trades towards the fitting of products which are considered ‘new’ is a major factor in the adoption of inclusive design, especially when, as the original research found, many older people rely on trades, such as plumbers, to help them specify and order products to improve their own homes [4].

Another barrier to the adoption of inclusive home design in a wider context is that inclusively designed products tend to be ‘invisible’ to the untrained eye, especially when viewed out of context in a retail environment. Unless consumers understand what to look for and how products can make their lives easier, they are not going to know what to buy and ‘demand-pull’ in marketing terms, will remain weak. Occupational therapists (OTs) were involved in the Project because they currently specify and install aids and adaptations in the homes of older people and are considered by the author to be key drivers in encouraging the uptake of inclusive by older consumers. The current prescriptive approach home adaptation used by OTs is recognized by the OT Community to being out-dated and recent moves towards a more ‘social’ model of intervention in the home are supported by current changes in the relevant Government Legislation towards more ‘Client Choice’, where control passes to the householder and where both the user’s physical needs and aspirations are central to the choices being made and implemented.

The Bradford project provided an opportunity to showcase inclusive design en-masse in different kitchen and bathroom settings, creating a unique opportunity to capture much needed inspirational images from which all the stakeholders could work. The photographs taken of the Bradford room-sets in the warehouse were used as a visualisation tool, to accompany and supplement the working drawings given to the various trades on site at the beginning of the Project. The images were also used to create a brochure for the Project launch event, detailing the inclusive elements within each room and of each product used, as a way of progressing the inclusive design agenda for all stakeholders.

In summary, the findings of the Bradford project were:

1. A large number of home products have inclusive features but few are fully inclusive
2. Even within manufacturers’ own collections it is difficult to specify only fully inclusive products. For example, the bathroom products in one of the Bradford bathrooms were by a single manufacturer, but the products were selected from

across eight different ranges within the manufacturer's portfolio to achieve the desired aim of full inclusivity.

3. The way in which inclusive products are communicated by the manufacturer to the user i.e. via product 'suites' or 'families' is often too prescriptive i.e. a fixed set of products per range and not interchangeable even within the manufacturers' in-house ordering systems, for example kitchen door fronts only available with one style of handle.
4. Consumers experience difficulty in identifying inclusive products which appear 'invisible' to the un-trained eye amidst a plethora of other products
5. Manufacturers' product information and instructions to the user are often illegible. Even if the product itself is inclusive, the instructions or point of service is often lacking. For example, small print and diagrams. Inclusive design should be a thought process which considers the user at every stage; from the purchase point; through to packaging; to the instructions for use and ultimately the design and use of the product itself.

3 User Interaction with Home Products

In the same way that the stakeholders require different forms of communication in order for them to carry out their part in the creation of a fully inclusive home, this 'live' project also highlighted communication with the householder as being an important element of the inclusive agenda. For example interfaces with systems and individual appliances within the home, which can be over-looked during the manufacturers' design process, particularly within kitchens and bathrooms. For example, clarity of oven, hob and washing machine controls are essential. If an oven is wall-mounted and has a side-opening door, this is physically beneficial for the user however, if the inclusive element of the design stops at this point and does not address the appliance controls, the appliance is not fully inclusive. In the case of the Bradford project this issue was highlighted by the search for two wall-mounted ovens with side-opening doors. In the UK there are currently only three models available, one of which is in the luxury end of the market and out of reach of the Project. The other two are mid range prices, but only one had controls which could be considered 'inclusive', as shown in Image (3) its attributes were:

1. The control knobs were contrasting to the oven fascia
2. They were shaped for easy gripping and operation
3. The position of the controls could be seen from across the room as a visual clue that the oven was 'on' or 'off',
4. The shape of the controls and built-in 'stops' as the controls were turned would indicate easily to a person with a visual impairment, the position of the knob and hence the cooking temperature of the appliance.

The second oven had circular knobs in the centre of the oven fascia, which required the user to turn and press the knob to work through a digital menu displayed in an LED window on the oven fascia. The design of this interface, whilst looking minimalist and uncluttered from a stylist's perspective, detracted considerably from



Fig. 4. Washing machine control panel



Fig. 5. Side-opening oven with well shaped knobs

the physical inclusivity of the appliance, requiring the user to rely solely on vision to interact with the digital display to operate the oven, with no physical clues to support the user.

Washing machine controls were similarly explored as part of the product selection process for the Project and many were also found to be lacking in full inclusivity. Machines which had larger and more inclusive apertures for the convenience of easier loading and un-loading often had single button operation of a layered, digital menu, displayed in a small window which was difficult to read. Alternatives such as machines with push button operation, which required finger strength and dexterity to depress buttons set into the appliance fascia, or in-set circular dials were difficult for weak, or less dexterous fingers to push, grasp and turn.

The machine which was ultimately specified as shown in Image (4) was from a medium to low price range but was chosen for the following 'inclusive' interface features:

1. Clear contrasting text across the control panel
2. Logical layout of controls for main wash and additional features
3. Contrasting, raised buttons for additional features (which can be counted horizontally by a person with visual impairment)
4. A colour-contrasting dial with surface-mounted grip operated using a light touch
5. Built-in 'stops' on the dial to ascertain the programme positions
6. The vertical position of the dial grip represents 'off' which is easily recognised both visually and as a tactile clue for users with a visual impairment.
7. Contrasting colour clearly indicating the drum aperture

The Bradford Project highlighted other interfaces within traditional home system design, which must be addressed if housing is to become more inclusive. For example, central heating controls are typically wall-mounted, digital, with small buttons and small LED displays. They are difficult to read for most people, but particularly difficult for people who wear bi-focal spectacles, who in order to read the controls, require good lighting and for the digital display to be set at an angle, so it can be picked-up by the bi-focal element of their spectacles. Manufacturers of central heating thermostatic control interfaces also make assumptions that users are familiar with digital interfaces and the layering and sequential mode of information retrieval, required to operating such devices.



Fig. 6. More, inclusive design of bidet toilet control by Sekisui House, Japan

A more inclusive approach to interface design within the home is demonstrated by Sekisui House, in Japan, where the user's abilities have been considered during the design process. In this interface for a bidet toilet a large 'rocker' switch frames an LED screen and can be operated by depressing each corner of the switch, using fingers or alternatively the edge of the hand or elbow, to interact with the various flushing and drying modes of the appliance. The inclusive approach to the switch, including the size and positioning of the buttons, means the device considers a wide group of users. The design principles of this interface could be easily transferred to other devices within the home.

In addition to small buttons and displays, other issues such as the height of controls can be a problem for some people, particularly shorter people or those using a wheelchair. Appliances such as kitchen hob extractors often have controls which are integral to the appliance which is fixed at high level and can be out of reach for some users. Remote control versions are available, but tend to be the more luxury, expensive models. In the case of the Bradford properties the issue of kitchen extractor hood controls being too high was addressed with lateral thinking. To overcome the issue of height, an isolator switch was wired at worktop height, so the extractor could be left switched on at the appliance, but controlled by the user from worktop height. In the second house at Bradford, an alternative extractor was chosen to demonstrate how the extractor fascia panel could be used as a switching mechanism, avoiding the need to stretch to reach small operating buttons. Pulling the fascia panel forward switched on the extractor and integral light whilst pushing it back, switched off the appliance. In both cases, the compromise was a lack of control over the different strength-settings of the extractor fan.

Safety was identified as being of prime importance in the original research, especially for older people. Issues surrounding safety were addressed within the fabric of the interior fit-out, but the products used were also selected for their careful balance between aesthetic values and safety attributes. For example, slip-resistant flooring was installed in the kitchens and bathrooms where the slip-resistance applied to users in shoes, but also in bare feet. The colour and tonal value of the flooring was carefully considered so it contrasted well with the colour of the walls and furniture to help users

with varying levels of visual acuity, determine the scope of the room, the edge of a worktop or the positioning of sanitary ware within the space. The colours initially available within the flooring range were limited, but the Manufacturer agreed to develop further colours and expand their range according to the author's specification.



Fig. 7. Slip-resistant flooring and contrasting colours between the floor, walls and sanitary ware for additional safety and user orientation

The inclusive design of the properties also catered for issues of maintenance or emergency by installing water cut-off switches on the water mains within each property. The non-electric device is installed as an 'interruption' within a run of copper water pipe and works when a physical switch is depressed by the user, cutting-off the flow of water. The interface of the switch has been designed as a simple flick-switch using a generic design 'language', which makes its operation intuitive for the user. Within the plastic unit, the switch is also highly coloured and contrasting for added visibility.

The switch is easy to install and addresses issues of inaccessibility of traditional water main stop-cock taps, which are often sited at low level behind kitchen units. It also addresses issues of manual dexterity, where little-used water main valves become stiff to operate, especially for weaker or less dexterous fingers. One switch unit per property can be installed in an accessible place in case of emergency, or in special situations, one unit can be fitted per bathroom or kitchen, to control the use or misuse of appliances by children or people with mental impairment.



Fig. 8. Water main cut-off switch

4 Conclusion

The Bradford project demonstrated that it is possible to select and combine mainstream home products to create inclusive kitchens and bathrooms within property interiors although full inclusivity has yet to be reached. However, despite having removed many architectural barriers to full home accessibility through concepts such as Lifetime Homes, and having explored physical accessibility within the interior design, it is clear that there is still more research required and further dialogue with manufacturers, if home system and domestic appliance interfaces are to become more inclusive in their design.

A further result of the Bradford Project has been a continuing dialogue with the 26 UK manufacturers who collaborated on the project and who are now aware of the benefits of inclusive design for their businesses. The images and findings of the project have been incorporated into an 'inclusive' design course aimed at manufacturers, occupational therapists, architects, designers and other housing professionals in order to progress the inclusive design agenda. The course aims to encourage the various stakeholders to adopt inclusive principles by translating the key principles into their own 'languages' of design, client choice, working practices, marketing and sales. The ultimate aim is to stimulate 'demand-pull' from consumers and housing professionals and 'supply push' for inclusive home products by manufacturers. This will in turn stimulate competition between manufacturers, to the benefit of the consumer towards developing a more 'social' model of designing, where the user's physical needs and aspirations are central to the design process.

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