

# **Design for Inclusivity: Assessing the Accessibility of Everyday Products**

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## **1 Introduction**

The older adult population in most developed countries is growing slowly, but continuously (Laslett, 1996). Several functional changes occur with age which may result in a decrease of perceptual, cognitive and motor skills (Smith *et al.*, 2000). In spite of this well-known trend, designers continue to design instinctively for “able-bodied” young people (Coleman, 1997). The result is products that are generally difficult to be used by elderly citizens and people with disabilities (Keates *et al.*, 2000). Clearly new inclusive design approaches are required to interpret and evaluate the range of functional capabilities of this sector of the population and include them into mainstream design.

The aim of this paper is to present a range of potential methods for assessing product accessibility. Although these methods provide valuable feedback about a product’s accessibility, many of them lack the ability to be linked with actual population data. An alternative assessment method, structured assessment, is proposed which enables designers to quantify with reasonable accuracy the numbers of users excluded from product usage.

## **2 Assessment Methods**

Designers need help to evaluate the level of functional capability required for comfortable and efficient use of a particular product. In this section, six methods of assessment are proposed for product accessibility evaluation.

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## 2.1 “Random” Assessment

“Random” Assessments involve identifying the main poorly designed features through a quick manipulation of the product. These assessments are easy and fast to carry out and do not require specific tools or evaluation conditions. Checklists such as the one presented in the Universal Design File (Story *et al.*, 1998) can be used as general guidelines for performing assessments. While this method may allow the identification of a product’s principal accessibility shortcomings, it is highly dependent on the assessor’s expertise.

## 2.2 Simulation

Simulation is the assessment of products using physical simulators to reproduce the reduction of physical capabilities that the users may possess. The assessor uses simulators to restrict capabilities in key parts of the body such as: eyes, neck, shoulders, elbows and hands. If adequately calibrated, it may be possible to simulate combined impairments. However, despite being a useful way of putting the assessor in the position of the user, it does not allow the assessor to fully understand the consequences of being impaired.

## 2.3 Expert Assessment

Expert Assessment is the thorough evaluation of design problems by someone who has an expert knowledge of the area under discussion. These assessments are usually used to detect critical problems before the product is released for more thorough appraisal. The assessments, however, can be applied at any stage of the design process. Assessment techniques such as *heuristic evaluations* and *cognitive walkthroughs* (Nielsen, 1993), which were originally developed in the field of human-computer interaction (HCI), can be valuable if applied in the context of product assessment.

## 2.4 User Observation

User Observation is the “non-intrusive” observation and evaluation of users handling the product in real life contexts. The method has a high degree of “ecological” validity since it allows the assessor to assess the user’s performance in a scenario that is very close to the actual product usage. Nevertheless, despite the degree of validity of the method, one must always consider that the users may perform differently when they know they are being observed. One popular approach to User Observation is the “think aloud” technique (Nielsen, 1993) where the users are encouraged to talk through their thinking process during the use of the product. This is very useful for the observer, but again encourages interaction

practices that may differ from those that may be expected in normal use as it is not typical to talk when using most products.

## 2.5 User Group Evaluation

User Group Evaluation is the assessment feedback provided by the users after trying a product in a real life setting. This method is usually utilised for evaluation purposes towards the end of the design process, since it can be time-consuming and relatively expensive, although it is also often used at major “milestone” stages of design. The method can provide robust feedback since it involves “natural” product use and a “hands off” approach. However, it may be difficult to select the right users. In addition, the validity of the results will also depend on the users’ level of honesty in providing feedback.

## 2.6 Analytical Assessment

Analytical Assessment is the exhaustive evaluation of all the design problems that a particular product may present. This method provides a complete and robust way of identifying all the existent accessibility problems. The method can, nevertheless, be relatively time-consuming and possibly expensive. The most critical characteristic is the fact that in spite of identifying all the existent problems, it will not distinguish their level of importance. Consequently, it prevents from establishing a problem hierarchy.

## 3 Structured Assessment

One of the drawbacks of the above methods is the inability to identify the number of users excluded from using a product. In this section, a method of product assessment is described that not only identifies accessibility shortcomings, but can also be linked with existing population data.

Structured Assessment is a systematic approach to product evaluation, which involves a six stage procedure: 1 – define context of use; 2 – identify constituent actions of use; 3 – identify product features interacted with; 4 – quantify functional capability and anthropometric demands; 5 – correct for multiple counting; 6 – prioritise product changes.

The main advantage of this method is the mapping of the assessment results onto population data (stages 4 and 5), thus providing an estimate of the number of users excluded from using a certain product due to the product functional capability demands. The assessment technique is based on the UK Office of National Statistics (ONS) capability scales (Martin *et al.*, 1994). Out of 13 functional capabilities defined by the ONS, seven were considered particularly relevant to product evaluation: motion; reach and stretch; dexterity; vision; hearing; communication; and intellectual functioning. The scales consist of levels

of capability, ranging from “able-bodied” (= 0) and “low level of impairment” (1 - 3) to “high level of impairment” (8 - 10). Each level of capability is defined by a description of tasks that can be performed by users at that level. These ONS descriptions can then be used to score the capability demands of the product. This score is then translated into an estimation of the number of users excluded from product usage.

The assessment procedure was applied to generic everyday products that are used to enable the performance of instrumental activities of daily living (IADLs). Of the many IADLs, a significant number are carried out in the home and can involve a variety of everyday products. *Kettles*, *toasters* and *cookers* were initially selected for these studies because of the role they play in performing one of the essential IADLs – food preparation. The structured assessment was applied to several samples of each type of domestic appliances.

The structured assessment appears to offer a reliable mapping to population data, since it uses these ONS descriptions as an assessment classification scale. The method has enabled the correlation of the assessment results with the population data, with promising levels of accuracy, regarding the number of users excluded from product usage. The method has also allowed the identification and prioritisation of the different accessibility shortcomings that the product features present, through the *frequency* and *severity* of the various problems. However, some of these scale descriptions present a certain degree of subjectivity that makes the quantification of capabilities difficult. While more products are currently being assessed, the scales are being redefined to allow faster assessments with more consistent results.

## 4 Conclusions

The assessment methods presented here offer different levels of resolution. For instance, while a *random assessment* provides general feedback about accessibility shortcomings and is fast to carry out, a *structured assessment* will supply more detailed information but will take longer to perform. The diversity of methods discussed should fit the variety of objectives and constraints in which design developers work. The key issue, irrespective of the method used, is mapping the assessment results to the UK Office of National Statistics (ONS) population data (Martin *et al.*, 1994), thus identifying the number of users that are unnecessarily excluded. The aims of this research are to define specific procedures and practical classification structures for the various assessment methods. Well-specified procedures will enable different assessors to achieve consistent and repeatable results. Practical classification structures will allow a more rigorous mapping to the population data.

Structured Assessments appear to be a promising way of evaluating a product’s level of accessibility. The objective is to extend similar procedure and classification measures to the other assessment methods, thus providing a set of practical, consistent, and fast product assessment methods that can be used by industry to facilitate the design of products with improved accessibility. In this

way, this work aims to encourage designers to practice more inclusive design by providing a means of helping them to address the issues with product accessibility.

## 5 References

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