Using Inclusive Design to Drive Usability Improvements Through to Implementation

J. Goodman-Deane, S. D. Waller, M. Bradley, P. J. Clarkson and O. Bradley

Abstract There are compelling reasons to improve usability and make designs more inclusive, but it can be a challenge to implement these changes in a corporate environment. This paper presents some ways to address this in practice based on over 15 years experience of inclusive design work with businesses. It suggests that a successful persuasive case can be built with three key components: a proof-of-concept prototype, an experience that enables the stakeholders to engage personally with the issues and quantitative evidence demonstrating the impact of a potential change. These components are illustrated in this paper using a case study that was conducted with Unilever to improve the images used in e-commerce. The ice cream brand, Magnum is one of Unilever's billion-dollar brands that implemented these changes. During an 8-week live trial, comparing the old and new images, the new images experienced a sales increase of 24%.

1 Introduction

Inclusive design has great potential to improve users' experience in an increasingly diverse and ageing population. For example, Waller et al. (2015) argue that 'products that are more inclusive can reach a wider market, improve customer satisfaction and drive business success'.

However, it can be difficult to persuade businesses to engage in inclusive design in practice (Fletcher et al. 2015). Previous researchers have highlighted the key barriers of a lack of resources and guidance, a lack of knowledge and time, the need for a justifiable business case, difficulty in changing business cultures and the perception that inclusive design is expensive (Goodman et al. 2006; Whitney et al.

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2010; Hussain et al. 2015). They argue that better awareness-raising, training and tools are needed.

We have found that training and tools are valuable, but they need to be integrated within a persuasive case for change. This paper presents such a case to drive inclusive design and usability improvements through to implementation in a real-world business context. This has been developed by the Cambridge Engineering Design Centre (EDC) through over 15 years of inclusive design research and consultancy in a wide range of sectors including consumer goods, digital devices and transport (see, for example, www.cfbi.com/inclusivedesign.htm).

The persuasive case presented in this paper has three key components:

1. develop a proof-of-concept prototype of a better solution that demonstrates in a tangible way that something better is possible;
2. enable business stakeholders to experience the issue, and the difference that the prototype solution makes for them and
3. quantify the number of people that the issue affects, and quantify the extent to which the prototype solution could reduce this number.

Driving change through to adoption involves convincing a wide variety of people in different kinds of roles. Some people are more likely to connect with evidence that is experiential or emotional, while others favour evidence that is analytical. Therefore, the EDC has found that the most successful persuasive cases contain both experiential and analytical elements, comparing a prototype solution against the original design.

The level of detail of each of these components depends on the type and stage of a project. An early-stage consulting project might present rough proof-of-concept prototypes, an artificially created simulated experience and some initial estimates for population numbers. These early-stage outputs can then be used to convince a small project team within a company to allocate further resources to consider the issue in more detail.

At a more advanced stage, a project can produce prototypes that are more refined, with more realistic experiences and more robust quantified evidence. Further down the line, if a project team actually implements the changes, their exemplar solution can become the proof-of-concept prototype that other teams use to inspire them to undertake similar projects. These project teams can experience the actual difference between the exemplar solution and its predecessor, and actual sales results and business cash flows can underpin the quantified evidence.

Ultimately, this can inspire other businesses to rapidly follow the approach, leading to improvements in the accessibility and usability of products or services within an entire category or industry. This has the potential to improve the situation on a wider scale for the population as a whole (Shneiderman and Hochheiser 2001).

This paper describes each of these three components with examples from a detailed case study and other EDC consulting projects. Section 2 describes the use of a prototype solution, Sect. 3 examines the experiential elements and Sect. 4 focuses on the more analytical elements.

1.1 Case Study

The approach in this paper has been used successfully in a variety of projects. However, the details of many of these are confidential. The approach is therefore primarily illustrated in this paper using a project conducted with Unilever, who have kindly agreed to make this case study public.

The project started in August 2013 and focused on the improvement of e-commerce images that are used to represent products on e-commerce websites. At that time, the universally accepted, default form of these images was a photograph of the product (pack shot). However, in many cases, it was difficult or impossible to discern key information from these images, particularly when displayed on a small mobile screen. With more than 50% of e-commerce transactions in the UK being conducted on mobile, this is an increasingly important issue (Criteo 2016). In this use case, some information was completely impossible for all people to read. This was particularly difficult for people with any degree of vision loss including age-related long-sightedness. Thus, this was an issue of inclusive design, but one that impacted large groups in the mainstream population.

The case study involved developing guidelines for new 'hero images'. These are digitally enhanced product images, specially designed for mobile e-commerce. They use digital representations of the product, sometimes enhanced with off-pack communications such as a square containing the product size. More information on hero images can be found at University of Cambridge (2017).

The work was conducted in several phases, each of which involved the three elements of the persuasive case described in this paper. The first part of the work involved assessing early-stage prototypes for a handful of Unilever brands, creating simulated screenshots to show stakeholders directly the difference they made and an expert appraisal technique to quantify this difference. Later stages involved launching the initial prototypes live, professionally producing a video to show the differences with more impact, and conducting a test with 3000 users in a simulated shopping environment. The prototypes were also developed into a set of guidelines for 'Mobile Ready Hero Images' that were made freely available to other companies outside Unilever (University of Cambridge 2017).

By August 2017, several retailers were prepared to publish results from live A/B split tests comparing pack shots and hero images. These are tests conducted with live shoppers, where 50% of the shoppers are shown pack shots and the other 50% hero images. Sales from the two conditions can be compared. Many other global suppliers of consumer products had followed Unilever's approach, including PepsiCo, Nestlé, Kraft and Mondelez. The product identifier global standards body GS1 issued a 'call to action' to form a working group to develop hero images into a new global guideline for best practice e-commerce images.

Throughout the progression from early-stage project to industry-wide adoption, the three components of the persuasive case were critical to promoting the snowball for getting stakeholders engaged in the topic, getting improved solutions developed and getting these solutions launched live with retailers.

The new images greatly increase the numbers of people who can discern key information from them, as shown in Sect. 4. This makes the images more inclusive and works to reduce exclusion from the e-commerce shopping experience. Being able to do your own shopping is one of the Instrumental Activities of Daily Living (IADLs) (Lawton and Brody 1969). Therefore, reducing exclusion in this way may enable more people to live independently, eventually reducing social care costs.

2 Develop a Proof-of-Concept Prototype

Project teams within businesses can often become focused on finding the next cost reduction, or on firefighting things that have gone wrong. In this context, they may assign a low priority to usability and inclusive design issues. Describing such issues and trying to convince stakeholders of their importance may have little impact. We have found that stakeholder engagement is likely to be much higher when starting on a positive note, by showing an example that demonstrates that the usability can be improved and illustrating how this can be done in practice.

An example or prototype provides something tangible that stakeholders can see, feel, interact with or experience (Warfel 2009). It also offers a common talking point for a variety of stakeholders. Prototypes do not have to solve all of the issues, and they do not have to be finished and be ready to implement. They do need to be refined enough to serve their purpose, which typically is to inspire commitment and funding to investigate a problem further and develop a solution that could be implemented.

There are numerous methods for creating prototypes, depending on whether the focus is on the physical shape, the interaction or the look and feel of the solution. For example, one EDC consulting project looked at the packaging for a chocolate box. The client produced a functional and appearance prototype of the chocolate tray, which was used to showcase how changing the tray shape could improve usability. Other EDC projects have used mock-ups of screens drawn in PowerPoint to prototype changes to user interfaces.

2.1 Case Study

In the Unilever case study, the proof-of-concept prototypes were examples of more inclusively designed e-commerce images for a small selection of Unilever brands. The prototypes showed how it is possible to digitally create a hero image that looks like the product, but uses the following principles to increase visual clarity:

- use the full canvas available for a square e-commerce image;
- enhance the size, shape and contrast of key product information in the image (brand, product type, product variant and size) and
- omit everything else to clean up the image.

Fig. 1 **a** Original and **b** improved e-commerce images for Magnum and Persil (images © Unilever, used with permission)

Examples of pack shots and hero images are shown in Fig. 1.

To showcase the effectiveness of these images, they were shown within a mock-up of an online retailer store. At different stages in the project, this mock-up was produced at different levels of fidelity, such as:

- taking screenshots of retailer stores and overlaying the new e-commerce images on top of the old ones;
- creating custom desktop and mobile-friendly webpages, copying the look and feel of existing retailer stores and using the new images and
- creating an entire simulated shopping experience for user trials, which replicated the interaction associated with shopping on Amazon.

3 Enable Stakeholders to Experience the Issue

Sometimes stakeholders are initially disinterested in inclusive design issues. We have made presentations to people who are nonplussed, distracted and sometimes even looking for an excuse to escape the presentation to deal with (what they consider to be) other higher priority issues.

It can be very effective to start with something experiential, which gathers interest, attention and enthusiasm from the stakeholders. This first engages the attention and then gives the stakeholders a personal experience of the issues (Kouprie and Visser 2009; Hosking et al. 2015). If they can experience some of the difficulties for themselves, it can move the issue from being ‘something that some unknown people experience’ to ‘something I can imagine experiencing for myself’. In some of our work, this experience has been so successful that previously disinterested stakeholders have been turned around to champion the improvements through to implementation.

There are many different ways to deliver an experience like this. Capability loss simulators are one method that can be very powerful. These are wearable devices or software that give stakeholders a direct experience of what using the original

products and the prototypes might be like for someone with a capability loss (Nicolle and Maguire 2003). Stakeholders can wear simulators such as glasses that reduce vision capability and gloves that reduce dexterity, when trying to use physical products. Alternatively, software can be used to manipulate digital images to show what they might look like to someone with a vision impairment.

Other ways to deliver an experience include asking stakeholders to complete a use case scenario, perhaps imagining themselves into the shoes of certain personas (Cooper 1999).

Less direct, but still powerful, are videos of real users struggling with products. These can be used to showcase problems and get stakeholders on board. Combining this with videos of proof-of-concept prototypes can be even more powerful, showing how the prototypes can make a real difference. Where prototypes are not yet functional, acted scenarios can also be used to show how they might work. These are also valuable to engage stakeholders with issues that might be hard to obtain direct video of (Newell et al. 2006).

3.1 Case Study

For the Unilever case study, the EDC created a video that included an embedded shopping challenge (see https://www.youtube.com/watch?v=1223GTQQctE). In the video, the viewer is shown a mock-up of an e-commerce website on a mobile device (see Fig. 2). A set of related products are scrolled vertically in a similar manner to a shopper scrolling through products while shopping online. The viewer is challenged to identify products that meet certain criteria—in this case, packs of Dove bar soap. The challenge is conducted twice—once with the original product images, and once with hero images. On their first try, most people can identify 0 or 1 products (out of 5) with the original images, and 3 to 5 with the hero images. The video is powerful because it enables viewers to experience the difficulty for themselves. If they themselves find it hard to identify images, then they are more likely to admit that something needs to be done.

The video was shown privately to brand teams and retailers across the world, to help to convince them to develop and adopt hero images. In the US, Unilever's vice president of e-commerce announced 'this video is a gift that keeps on giving', in reference to its significance of convincing the US retailers, Walgreens, CVS and Walmart to adopt hero images.

The video was very effective, but it is also possible to deliver a convincing experience with something simpler. In addition to the video, we created PowerPoint slides, one showing an e-commerce pack shot and one showing a hero image of the same product, both with no text (see Fig. 3). Audiences were challenged to discern the brand, the type of product, product variant and product size from these images. Only the brand is really discernible in the first (and then only if the viewer is familiar with the brand), but all four messages are discernible in the second to someone with average eyesight. The authors believe this challenge was the

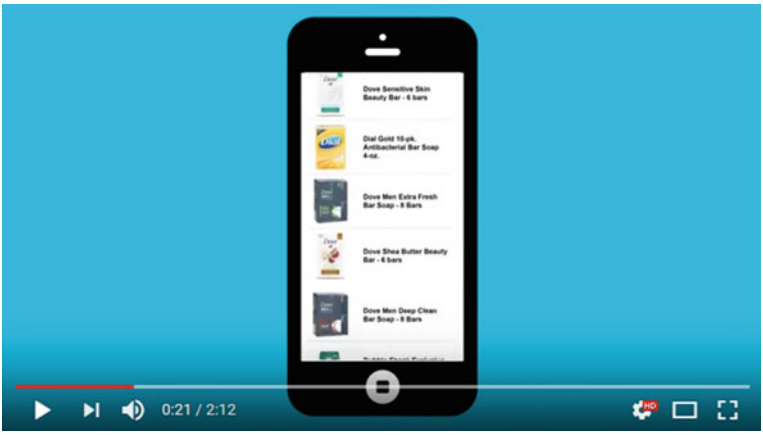

Fig. 2 Still from the Unilever case study video showing the online shopping environment used in the simulated shopping challenge (image © Unilever, used with permission)

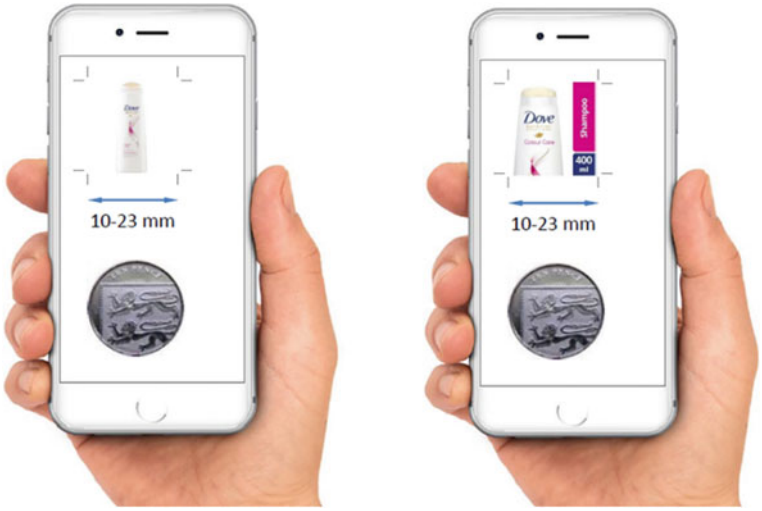

Fig. 3 Images used in presentations to illustrate the difference that hero images make. For the experience to be accurate, the images should be sized so that the 10 pence coin is the correct size

'moment of truth' that convinced many global retailers to support our position. As further evidence of their success and impact, other institutions have replicated and presented these two slides.

4 Quantify It

The experiential message can be very powerful in convincing stakeholders to become engaged with an issue or topic. However, some stakeholders require more quantitative evidence. Furthermore, in order to get a proposed solution approved within a large business, many project managers need quantified evidence for the likely effect on profit and loss. Different kinds of quantitative evidence may be needed in different situations, with managers asking questions such as:

- how many customers does this issue affect?
- how much could the change increase sales?
- what is the likely return on investment?

In many inclusive design projects, some quantitative evidence is required at an early stage, in order to gather some momentum and persuade stakeholders to take proposals further. Full answers to the questions above would require further investment to find out. For example, there is often not enough time or funding at this stage to conduct the large-scale user trials necessary to really determine how many customers would be affected.

Instead, the EDC has developed an exclusion audit process to give early-stage estimations of the number of users unable to access or use the product or service and the proposed prototypes (Waller et al. 2010). In this process, the use of the product is modelled with task analysis, and each task is analysed according to the demands made on the users' vision, hearing, thinking, reach & dexterity and mobility. These levels of demands are then compared with survey data on the UK population to estimate what proportion of the population would be unable to meet the demands.

The exclusion audit helps to relate improvements in usability to the numbers of customers affected. In turn, this can be used to estimate initial answers to questions of sales increase and return on investment.

Having assisted the EDC with a variety of consulting projects involving exclusion audits, Rob Morland from the Centre for Business Innovation says, 'Quantifying user experience in terms of population exclusion provides a common language that designers, managers, usability experts and marketing teams can all relate to'.

Once some more funding is available, more in-depth work can be conducted to gain more detailed quantitative figures. For example, in the Unilever case study, simulated shopping trials were valuable in examining the impact of the hero images. But these could only take place after key stakeholders had been sufficiently convinced by early prototypes.

4.1 Case Study

A key motivator in the Unilever case study was the lack of visual clarity of pack shots. It was much easier to discern key product information from the new hero image proposals than from the pack shots. The experiences in Sect. 3 showed the stakeholders this directly, but some may question whether these experiences apply to the wider population.

To address this, we carried out exclusion audits on the images. There are four critical pieces of product information that consumers typically want to know: brand, product type or format, product variant or flavour and product size. These are conventionally included in the product description. The SEE-IT method (Waller et al. 2016) was applied to the images to estimate the proportion of the UK population who would be unable to determine these critical messages from the images.

SEE-IT is a version of an exclusion audit specifically designed for assessing the visual clarity of flat images that are handheld, such as images shown on a mobile phone screen. It takes account of age-related long-sightedness and the variation in 'normal' vision capabilities, so the exclusion numbers presented are much higher than other methods might predict. In SEE-IT, the assessors determine the furthest distance at which they can discern a particular piece of information or feature in the image. This distance is used together with a measure of the assessors' eyesight and data on vision capability in the wider population to determine what proportion of the population would be unable to discern the information or feature in the image comfortably in normal use.

The results of SEE-IT on an example are shown in Fig. 4. Note that the variant in this example is communicated by the colour blue and the words 'Non-Bio'.

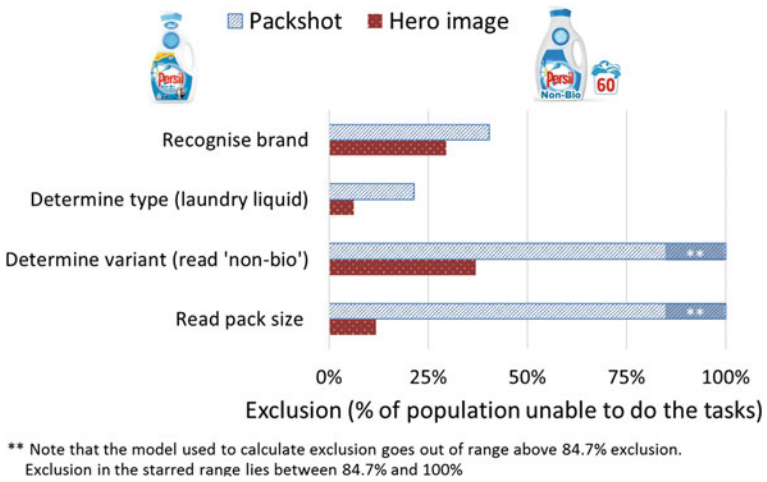

Fig. 4 SEE-IT results for the pack shot and hero image for Persil laundry liquid

The analysis presented here is for reading the text because not all shoppers are familiar enough with the products to distinguish them by colour alone.

Oliver Bradley, e-commerce Director for Unilever, says, 'The exclusion results made a compelling case that the original e-commerce images were not fit for purpose, and the new proposed solution was more effective for a significant proportion of the population. This case was quick to understand, and compelling enough to convince brand teams around the world to develop hero images, and retailers around the world to accept them'.

Following on from our early-stage audits using SEE-IT, some retailers were convinced enough to run live A/B split tests comparing pack shots against hero images. The split test results provided further quantitative evidence which helped to convince other stakeholders on a global basis. For example, Magnum is just one of Unilever's billion-dollar global brands to have benefited from the new images, with a 24% increase in sales measured in an 8-week A/B split test in a French retailer.

5 Conclusion

We propose that a successful persuasive case for usability improvements can be built with three key components: a proof-of-concept prototype, a personal experience and quantitative figures. The experience is important to help stakeholders engage personally with an issue and get them to 'feel' it for themselves. The quantitative part is important to convince business decision-makers to make the change happen. Both experiential and quantitative parts are most successful when they compare a proof-of-concept prototype against the current solution.

These three components have been found to be critically important in over 15 years of experience in working with industry on inclusive design projects. They have been illustrated in this paper using a case study with Unilever, where both experiential and quantitative parts were used to convince brand teams to develop improved e-commerce images and to convince retailers to accept the new images. In August 2017, images that follow these guidelines have been developed by Unilever, P&G, Nestlé, GSK and many other global FMCG suppliers. The images have been accepted by over 68 retailers from 28 countries. In September 2017, GS1 (an independent standards body) issued a call to action to form a working group to develop these image recommendations into a formal set of GS1 guidelines.

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References

Cooper A (1999) The inmates are running the asylum. SAMS Publishing
Criteo (2016) The state of mobile commerce 2016. http://www.criteo.com/resources/mobile-commerce-report/. Accessed 10 Nov 2017
Fletcher V, Bonome-Sims G, Knecht B, Ostroff E, Otitigbe J, Parente M et al. (2015) The challenge of inclusive design in the US context. Appl Ergonomics 46(B): 267–273
Goodman J, Dong H, Langdon P, Clarkson PJ (2006) Increasing the uptake of inclusive design in industry. Gerontechnology 5(3):140–149
Hosking I, Cornish K, Bradley M, Clarkson PJ (2015) Empathic engineering: Helping deliver dignity through design. J Med Eng Technol 39(7):388–394
Hussain A, Ahmad A, Case K (2015) Inclusive design drivers and barriers - A manufacturing perspective from Pakistan. Prod Manuf Res 3(1):289–309
Kouprie M, Visser FS (2009) A framework for empathy in design: Stepping into and out of the user's life. J Eng Des 20(5):437–448
Lawton MP, Brody EM (1969) Assessment of older people: Self-maintaining and instrumental activities of daily living. The Gerontologist 9(3):179–186
Newell AF, Carmichael A, Morgan M, Dickinson A (2006) The use of theatre in requirements gathering and usability studies. Interact with Comput 18(5):996–1011
Nicolle CA, Maguire M (2003) Empathic modelling in teaching design for all. In: Stephanidis C (ed) International conference on human-computer interaction; Universal access in HCI: inclusive design in the information society 4: 143–147
Shneiderman B, Hochheiser H (2001) Universal usability as a stimulus to advanced interface design. Behav Inf Technol 20(5):367–376
University of Cambridge (2017) Mobile ready hero image guidelines. http://ecommerce.inclusivedesigntoolkit.com. Accessed 10 November 2017
Waller SD, Bradley M, Hosking I, Clarkson PJ (2015) Making the case for inclusive design. Appl Ergonomics 46(B): 297–303
Waller SD, Goodman-Deane JA, Bradley MD, Cornish KL, Clarkson PJ (2016) Walking backwards to quantify visual exclusion. In: Langdon P, Lazar J, Heylighen A, Dong H (eds) Designing around people. Springer
Waller SD, Langdon PM, Clarkson PJ (2010) Using disability data to estimate design exclusion. Univers Access Inf Soc 9(3):195–207
Warfel TZ (2009) Prototyping: A practitioner's guide. Rosenfeld Media
Whitney G, Keith S, Schmidt-Belz B (2010) The challenge of mainstreaming ICT design for all. In: International conference on computers for handicapped persons ICCHP 2010: computers helping people with special needs, Vienna, Austria, pp 583–590, July 2010