

Inclusive Design and the Bottom Line: How Can Its Value Be Proven to Decision Makers?

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Abstract. Designing technology products that embrace the needs and capabilities of heterogeneous users leads not only to increased customer satisfaction and enhanced corporate social responsibility, but also better market penetration. Yet, achieving inclusion in today's pressured and fast-moving markets is not straight-forward. For a time, inaccessible and unusable design was solely seen as the fault of designers and a whole line of research was dedicated to pinpointing their frailties. More recently, it has become progressively more recognised that it is not necessarily designers' lack of awareness, or unwillingness, that results in sub-optimal design, but rather there are multi-faceted organisational factors at play that seldom provide an adequate environment in which inclusive products could be designed. Through literature review, a detailed audit of inclusivity practice in a large global company and ongoing research regarding quantification of cost-effectiveness of inclusive design, this paper discusses the overarching operational problems that prevent organisations from developing optimally inclusive products and offers best-practice principles for the future.

Keywords: Inclusive Design, Cost-Benefit Model, Principles for Change.

1 Introduction

Over the last decade, inclusive design has increasingly gained prominence as a design approach that intends to expand the boundaries of product usage to the greatest extent possible. Today's fast-paced and short cycles of technological innovation give people little time to become cognisant of the latest technological devices and effectively utilise them in daily lives [19]. That, coupled with the unprecedented ageing of the world population [29] and the related increase in various ailments [31], makes the inclusive design approach even more valid than ever. Accordingly, the current 'we act despite the data' approach of many companies is no longer supported in the modern information-savvy age where evidence-based reasoning is key to informed decision making by industry and government. Hence, the responsibility is now on companies to support their designers and engineers in developing products and services that

could support today's rapidly changing population and the sustainability of the modern world.

The strong financial case for inclusive design, demonstrated by the commercial success of mainstream products, such as the OXO Good Grips line of kitchen and garden tools, the BT Big Button and Freestyle phones and the Ford Focus, indicates that the effort and cost investments involved in its application will be largely compensated for in the longer-term [14, 15]. For example, Karat [14] delineates a \$10 return on investment for every dollar spent on usability.

However, as has been shown by various studies on the uptake of inclusive design in industry [8, 9, 12], moving from an aspiration to designing inclusive products to the actual delivery of them in today's challenging markets is not straight-forward. Building on over a decade of research on the uptake of inclusive design in industry, through a detailed audit of inclusivity practice in a global engineering and communications company and a preliminary study on 'cost-benefit' modelling, this paper:

1. explores the operational challenges that consumer organisations face in their ambition to be truly inclusive;
2. offers best-practice principles for change;
3. demonstrates how cost-benefit modelling could help organisations understand the effect that the inclusive design approach can have on their profit margins (i.e. it can lead to faster delivery to market, reduced costs related to rework, support calls and product returns, and potentially higher revenues as a result of faster market presence and increased uptake of a more intuitive and satisfying product or service).

The act of designing (inclusively) is not just limited to the will of designers, but is primarily influenced by the complexity of the environment in which the design process takes place [1, 25]. In particular, as shown herein, it requires five key elements:

1. *Users* placed at the heart of every design decision;
2. *People* with authority;
3. a highly-optimised *Process*;
4. a well-executed *Practice*;
5. adequate *Profit* related projections.

When placed together, these core themes can work holistically to ensure that the correct *People* with authority are included in the design process, the most optimal and effective *Process* is laid out, best *Practice* is followed and ultimately that *Users* are satisfied with their product. *Practice*-related decisions and *User* satisfaction with the resultant product, in turn, have complicated interdependencies with one another, as well as the *Profit* element, via various direct and indirect channels.

Overall, this paper proposes that engineering a product in line with these five elements can lead to substantial cost and time savings in terms of project delivery and rework, higher quality products, more satisfied users, socially sustainable products and increased customer loyalty and advocacy.

2 Lessons from the Past

The process of learning to understand users and their experiences, particularly in an industrial context, requires commitment and a structured investment of time [32], and “a reward structure that motivates attention to usability” [1]. In response, Keates and Clarkson [15] have shown that the effort and time investments put into inclusive design early on and throughout the design cycle will pay dividends in the long-term.

Previous studies [8, 9, 12] have also examined the uptake of the ethos and practice of inclusive design in industry, describing both existing success stories and barriers to adoption. They found poor fit between the structure of many inclusivity support tools (i.e. they can be inaccessible and visually unstimulating) and the ways in which designers think and work, as well as poor awareness within senior and middle-management levels, and limited communication across the company and clients. Another study [20] has also uncovered that designers are given little chance and support to focus on inclusion because of cost and time restrictions, and that the tendency is to prioritise functional integrity over accessible and usable design.

To complement these previous studies by providing the most up-to-date view on these issues and to distill pragmatic recommendations for change, given the now legal obligation for companies to adhere to the Equality Act 2010 [28], the audit of the current state of inclusive design practice at a global engineering and communications company was conducted to understand more about how it is practised in everyday business, and what further improvements are yet to be made (if any).

3 Audit of Inclusive Design Practice

The audit of the current state of inclusive design practice at British Telecommunications plc (BT), which has many years’ experience of concentrating on inclusion and in 2007 co-developed the *Inclusive Design Toolkit* [26], was conducted to understand more about how inclusive design is practised in everyday business. This study was performed between January and April 2012 by the authors of this paper to specifically: (1) identify successful inclusivity-led processes, products and services developed to date and (2) explore existing challenges to employing inclusive design. The results led to the distillation of ten overarching principles for further development of inclusive design practice, which can be applied to other large and small organisations.

The approach to the audit involved interviewing 14 experts and stakeholders from across the business, selected for their good knowledge of inclusivity and internal processes in the company. Semi-structured interviewing technique was used to elicit the information and the general inductive analysis [27] approach was employed to identify the dominant themes inherent in the collected data. To complement these, additional analyses of the tools and resources mentioned by the interviewees were conducted. A high-level overview of the design cycle processes was also performed. Collectively these studies led to the identification of three overarching themes: *People*, *Process* and *Practice*, with the focus on *Users* being placed at the heart of them. The detailed findings from within these three themes were subsequently translated into ten principles for

change (as seen in Fig. 1) in order to help accessibility/usability practitioners and product/service managers from any large, medium-sized or small organisation make more informed decisions regarding the design of future products and services. Depending on the strategic intent of the organisation in question, these principles can be broken down into more specific steps, with more effort required in some areas than others to reduce the gap between current and desired practice.

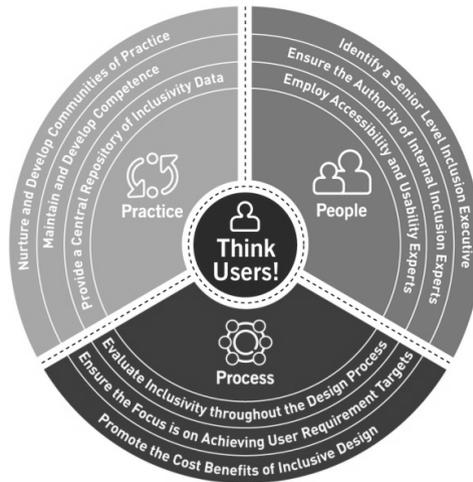


Fig. 1. Ten principles for the development of inclusive design practice

More specifically, within the *People* theme, most interviewees said that, although there is a level of proactive design for intuitive user experience, there are also concerns that inclusion can be de-prioritised by those who are dealing with numerous and complex business decisions. It was suggested that to raise inclusivity in the corporate agenda, a senior level executive could be appointed to champion inclusion across his or her peer group and at all levels of the company. It was also found that internal experts have good knowledge about inclusivity, but often and for many reasons, the expertise of external agencies is favoured over these internal experts. Enhanced collaboration between internal and external specialists is, therefore, seen as a potential solution to this issue.

Within the *Process* theme, participants said that, often due to time and cost constraints, a thoroughly-researched understanding of users' needs can be omitted from the requirements capture process and user testing can be performed at a late stage in the design cycle. Even if user requirements are considered early on, they may become de-prioritised as they pass through multiple project stakeholders with conflicting demands and finite budgets. Also, there is sometimes the issue of a trade-off between the design of back-end of systems and the front-end design. Therefore, it is important to articulate cost and benefits associated with inclusive design and build in appropriate project timescales from the very beginning.

Within the *Practice* theme, inclusion was found to be undertaken across the company but varied between teams. Although supporting tools and resources were plentiful, they were located across multiple internal websites, leading to challenges in accessing necessary data and keeping these online resources updated in line with best practice and market advances. A centralised repository of information is suggested as a solution to this issue. As a result of the audit's specific findings, informal or formal case studies regarding the success of previous inclusively designed products and services are currently used to demonstrate the effectiveness and potential benefits of the inclusive design approach, plus they are used to give a template as to the techniques deployed (e.g. prototyping, user testing, heuristic evaluation etc.). Similarly, education, training and support resources are presently being deployed across the business to bring those involved in the delivery of consumer products up to speed with the latest thinking and practices in inclusive design.

4 Cornerstone of All *Profit* Projections – Cost-Benefit Analysis

Among the four components critical for achieving optimal inclusion practice – *Users, People, Process* and *Practice* – *Process* underpins much of how *People* are organised and thus approach decision-making, and what particular *Practice* they will adopt to produce a given product for the benefit of *Users*.

Interestingly, a fifth element – one that emerged indirectly during analysis of results, but needs to be further investigated and commensurately calculated – *Profit*, in turn relates to what, why and how a given *Process* will be followed. In particular, one of the major findings of the audit and previous research was that inclusive design can be de-prioritised due to budgetary constraints. However, cost-cutting on inclusivity during the *Process* can result in higher costs later on as products are deemed unusable, leading, in turn, to product returns and costly helpdesk calls. Similarly, if inclusion is considered at a later stage, retro-fitting a product to be inclusive (i.e. re-designing it) also incurs extra costs. For example, Pressman [22] has shown that 80% of the software life cycle costs are spent in the post-release maintenance phase. He also argued that the relative cost of a change rises during development from 1.5 units of project resource in the concept phase, to 6 units during the development phase, to 100 units of resource during the post-release maintenance phase. Moreover, since buying decisions are generally made primarily based on usability, Wixon and Jones [30] demonstrate that revenues can be 80% higher for the second release of a product performed with a focus on usability engineering as compared to the first release without it. Inclusive design conducted over several iterations from the outset can also help to bring higher-quality products faster to market, which, in turn, can result in 10% higher revenues because of increased volume or increased profit margins [6].

It is a challenging act for a product development team responsible for allocating budget to inclusivity to adequately and appropriately quantify its benefits against the up-front costs (and the implications of not considering it) at the beginning of and throughout projects. While the success of a number of inclusively designed products illuminates a strong financial case for inclusive design (e.g. the OXO Good Grips

product range), before committing to the inclusion approach organisations quite reasonably want to see a quantifiable projection of their investment. This is because decision makers often view inclusivity activities as a potential risk to the deadline of their project, even when end users consider inclusion as an important product attribute [24]. In general, as shown by the abovementioned audit, the best way to achieve inclusion is by having its importance stressed to the development team by management.

The remainder of this paper is, therefore, focussed on investigating the *Profit* element, which largely governs the availability of options for the other four elements. In particular, the value and benefits of cost analysis (cost-benefit analysis) have long proven to be advantageous to companies in setting out *long-term* (e.g. looking at repercussions in the nearer and further future), *wide-view* (e.g. allowing side-effects of many kinds on many persons, industries, regions, etc.) and *desirable* business plans [13, 23]. More specifically, cost-benefit analysis measures all the positive (beneficial) and negative (costly) consequences of a design/decision in monetary terms [2, 3].

Previous research has shown that the use of quantitative data during the inclusive design process can be useful for designers, as well as business managers and decision makers [8]. Moreover, it is suggested that the use of projection models has a great advantage over other ways of information capture and representation in problem-solving because they are better, quicker, cheaper and safer at: capturing the complex and fast-flowing nature of design activities, grouping together related information, placing similar concepts at adjacent locations, minimising shifts of attention and automatically supporting a number of perceptual inferences [5, 16].

4.1 Existing Inclusion Cost-Benefit Analysis Models

A wide adoption of inclusive design activities in the product design process has been a challenge since the beginning of usability activities over fifty years ago [21]. One reason for this is that the benefits of better inclusivity are not always easily identified or calculated. For example, while the benefit of a decreased need for product support is rather straight-forward to calculate, the impact of better inclusivity on improved company reputation is significantly more complicated to quantify, even when it is clear that poor accessibility and usability hurt company reputation [17, 24]. However, Mayhew and Mantei [18] posit that the calculation of the cost of better inclusion can be fairly straight-forward given that the necessary user-centric tasks are adequately identified. In line with this supposition, two different approaches for identifying the costs and benefits of inclusive design have been proposed to date. Two of the models [4, 10] approach usability cost-benefit analysis through identification of the costs and benefits of user-centered design activities. Four of the models [7, 10, 13, 18] assess usability cost-benefit analysis through investigation of the costs and benefits of individual user-driven tasks. Among the core benefits identified by these different models are: increased sales, increased productivity (i.e. decreased customer support, overall savings in development time and cost), reduced design/development personnel costs and need for costly expert peer-support, fewer changes in late stages of the life cycle, reduced cost of training and greater satisfaction for the end user. However, the present limitation of the existing models is that they do not clearly present an overall formula

for calculating the value of inclusive design benefits. The ongoing work delineated herein, therefore, focuses on developing a tangible, but usable, formula for product managers to calculate quantitative cost and benefit data to justify expenditures on inclusive design.

So far, a review of existing models and modelling of inclusion processes at BT contributed to devising the following cost-benefit formula. It should be noted that there are two scenarios to which this formula can be applied: projects where inclusive design was not taken into account from the start and projects where it is planned to be considered from the onset. This proposed cost-benefit formula for inclusive design is:

$$\text{Benefit [value of increased productivity + value of increased sales]} - \text{Cost of selected inclusive method [(no. of experts * hrs * hourly rate) + (no. of users * hrs * hourly rate) + cost of equipment/rooms/travel]}$$

Where the *benefit*-related elements can be calculated using the following sub-formulae:

1. Value of increased productivity (e.g. less rework, fewer support calls, enhanced user learnability) = (no. operations/operators * hrs saved per operation * cost per operation);
2. Value of increased sales = (no. new sales * cost per sale).

The assumed key benefits from applying this inclusivity formula from the outset are:

1. *increased productivity*, as a result of putting more effort into inclusive design at the outset to better understand the design challenge under consideration and hence reduce rework task volumes and times at a later stage. More specifically, since planning generally constitutes only a small part of the *total effort*, the benefits can be significantly greater than the additional costs of increasing design effort. For example, assuming that *initial design effort* = 10% of *total initial effort*, a 20% increase in *design effort* (from 10% to 12% of *total initial effort*) would only represent 2% of the total. Yet it would save the cost of rework, which could easily amount to as much as 30% of the total costs;
2. *increased sales*, as inclusive design leads to better user interaction, lesser chance of misunderstanding of the interface, and thus fewer errors, and fewer support calls, complaints and returns. The number of sales may also increase due to more subjective factors such as increased customer advocacy – one satisfied customer is likely to tell eight other people about positive product experience on average through the traditional ‘word of mouth’ channel; good “word of *mouse*” will travel even further [11]. This, in turn, may lead to a ‘viral’ effect in the uptake of the product – an intuitive user interface design, as shown with the Apple’s *iPhone* and *iPad*, may be the unique selling point that enables this phenomenon to take place.

Furthermore, to calculate the total cost of development in a scenario where inclusive design is/was *not* considered from the outset, and were rework will be/was needed to correct the product, the following formulae have so far been devised by the authors:

Total Cost of Effort = *initial effort + additional effort to correct product (total man hrs * hourly rate)*, where

Cost of Initial Effort = *initial design effort (total man hrs * hourly rate) + initial planning and development effort (total man hrs * hourly rate)*

4.2 Case Study – How It Is Never Too Late to Adopt Inclusive Design Approach

A recent inclusion redesign example is given here to demonstrate how a user-centred design approach and close collaboration with technical teams can lead to cost savings and sale increases. An outbound sales system used by call centre agents was analysed in-depth by BT in terms of: (1) its user interface design (e.g. testing criteria such as learnability and efficiency); (2) its projected operational efficiency (at the time, to cope with demand, if the system stayed as it was the company would need to recruit 13,000 more call centre agents and incur the related costs); and (3) technological constraints (the underlying system could not be cost-effectively tailored).

The usability team conducted qualitative analysis of user needs, involving an ethnographic study of the agents' use of the tool within the call centre environment, taking into account the agents' roles and responsibilities, targets, skill levels etc., as well as their working environment in a day-to-day context. Prototypes of new user interfaces were then iteratively tested with these users to reach a final design. Adoption of the new system by agents was helped by this consultative approach. As a result of these and collaborative work with technical teams, a more intuitive interface, which enabled the advisors to 'walk up and use' the system, was deployed. The changes to the usability of the interface enhanced the learnability aspect of the system such that training time was reduced from 6 to 2 weeks (leading to associated cost savings). The efficiency of the transaction was also increased as the duration of the calls on average decreased by 18%. In addition, sales increased by many thousands of units.

Overall, the redesign of the system helped the company make substantial costs savings, but even more significant savings could have been made had the inclusive design approach been adopted from the outset.

5 Discussion and Conclusion

This paper has highlighted the value of inclusive design in contributing to production of good, satisfying, responsible, socially sustainable and commercially viable products. Ultimately, inclusive design can be achieved by: (1) placing *Users* at the heart of every design decision; (2) ensuring authority of inclusion-expert *People*; (3) laying out a highly-optimised *Process* committed to achieving user requirement targets; (4) following a well-executed *Practice* set on developing collaborations and continually developing competence; and (5) early on preparing adequate *Profit* related projections (i.e. cost-benefit models), which can be also manipulated throughout the design cycle, to ensure that the other four elements are implementable and that cost-heavy and time

consuming rework is minimised. It is proposed here that when these five elements are appropriately considered and methodically implemented from the onset, companies are likely to bring higher-quality products and services faster to market, increase customer satisfaction, have cheaper operational costs long-term and fewer rework projects, and free a lot of time for work on latest innovations.

Future work will focus on further developing the cost-benefit model for demonstrating to companies the value of considering and following the inclusive design approach from the outset.

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