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READY TO USE, EASY TO EVOLVE

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1. Introduction

We are currently experiencing a global mobile revolution, which, unlike the steady growth of Internet access, has increased rapidly in recent years. In the last 12 months, for example, 6 million people have accessed the Internet on their mobile phones for the first time [ONS 2011]. Internet and mobile phone usage amongst older people, however, remains lower than in other age groups. Not surprisingly the usage of Internet-enabled mobiles is extremely low among older people, with only 13% of those aged between 55-64 and 4% of those aged between 65-74 owning and using a mobile internet device, compared to 50% for younger users [Ofcom 2009].

Mobile phone technology is developing at speed, with phones incorporating increasing numbers of applications and functions, turning many new phones into ever more sophisticated computers. Customers have increasing choice among several types of phone; Smartphones, Smartphone/2G hybrids, simpler 2G phones and phones with reduced functionality. These phones target different markets and needs; from business people, young people, social users, light users and older people. Despite the choice, Smartphones are increasingly dominant in the UK mobile phone market, accounting for 67% of sales in 2011, according to Ofcom, leading many to predict that they are the future of mobile technology. It is therefore important to understand any possible implications this may have for older users, who may be unfamiliar with this technology. Due to the additional functional complexities of Smartphones it is possible that older users will feel alienated, by the growing difference between phones that meet the needs of young and older customers. This could, in turn, lead to increased stigmatisation of phones for older people. If designed more inclusively, however, could Smartphones facilitate better access to communication and services for older people, providing greater technology choice and flexibility? Unfortunately, many in society have misplaced and outdated perceptions regarding older people, seeing them as a homogenous group [ILC 2009]. This misconception extends to the adoption of technology, portraying older people as unable to use or learn to use modern technology. This misrepresentation of need and ability has given rise to a design approach that focuses on reduced functionality to satisfy a user group considered passive and uniform. This approach is evident in the design of some mobile phones that rely on a reduction of features as a means of making them more user-friendly, and appropriate for use by older people [Renaud and Van Biljon 2010]. Unfortunately, this can result in patronising and stigmatising products that perpetuate the perception that older people are incapable. In fact, there can be huge variation in ability, cognitive function, interests and lifestyle within this large age group, like any other.

This paper offers a view that opposes the current trend of simplification in technology products for older people. Despite the development of the Seven Principles of Universal Design by Ron Mace and a group of designers and architects in 1997, it is clear that many mobile phones, mainstream or not, do not apply the principles. The proposed view is based on the idea that people of all ages have the ability

to learn and develop new skills and that technology products should be flexible and intuitive rather than merely ‘simple’ and ‘easy’.
Referring to the navigation and interface of a mobile phone, the hypotheses are:

1. People are capable of learning new skills, at their own pace
2. People have diverse abilities, needs and aspirations
3. Based on life experience, people are generally capable of making satisfactory choices
4. People deserve desirable, intuitive and stigma free products
5. Most people are capable of reviewing and modifying choices.

Through the above hypotheses, this study aims to elaborate a position that may encourage designers, marketers and businesses to challenge current approaches to technology and product design. The objectives we aim to achieve are:

1. Review the current literature in the areas of age related impairments, lifestyle and technology usability
2. Identify a methodology that enables the hypotheses of our design approach to be evaluated
3. Establish the requirements for a new mobile phone that can embody the design hypotheses we advocate.

2. Literature

Design can be empowering if it supports individuals' needs, generates satisfaction and fulfils aspirations. To accomplish this, designers must comprehensively understand, realistically assess and successfully interpret their target users and the context they are designing for. Designing for older people also requires an understanding of the ageing process and its implications on design. The following section details research being carried out by UK based research centres, examines the impairments created by age, analyses statistics that demonstrate trends of usage of mobile technology by older people and examines research that scrutinises current mobile phones against the needs of older people.

2.1 Inclusive design

Design has the potential to include or exclude users, but through an improved understanding of users the possibility of exclusion can be minimised. Inclusive design puts the user at the centre of the design process, by building a comprehensive understanding of the needs and aspirations of a wide range of users. There are several research centres in the UK which devote their efforts to inclusive design research, projects and new product development, these include the Human Centred Design Institute Group at Brunel University, Age UK’s Engage Business Network, The Age and Ability Research Lab within the Helen Hamlyn Centre at the Royal College at Art and The Engineering Design Centre at the University of Cambridge. These organisations have similar remits; improving the lives of marginalised people by eliminating barriers within the business community, developing novel research and new product concepts and improving guidance on inclusive design practices.
The annual DBA Inclusive Design Challenge competition winner for 2003 was ‘ello: a mobile phone device for technophobes’, designed by Seymourpowell. The RCA supported competition winner’s aim was to provide a commercially viable phone, which was both intuitive and capable of enhancing the confidence of low users. The simple clamshell design would enable users to make and receive calls, the removal of a display screen would elongate battery life, and it would have both speed dial and voicemail facilities. Whilst the mobile phone’s functional simplification will serve the needs of some users, for others it will only serve to further segregate them. A recent project at the Royal College of Art (http://www.hhc.rca.ac.uk/2261-2270/all/1/Out_of_the_Box.aspx) suggests that the physical design of a mobile phone alone does not make it easy to use. The RCA’s research suggests that areas for improvement lie in improved packaging and manual information. While these are important factors in extending the usability of the phone, this research stresses that the key to improved usability can instead be found in the relationship between the phone’s physical design and its information architecture. Due to lower phone usage among older users, improvements to packaging and manual information may help users with the initial setup of the phone but over time may prove less effective. Improving the phone’s information architecture, however, would create intuitive menu structures that

could guide users through the phone without the need for manuals and create longer lasting user satisfaction.
Work on the design of mobile phones has also been undertaken by the Inclusive Design group at the Engineering Design Centre (EDC) at the University of Cambridge. The group has highlighted the need to combine usability and elegance and avoid stigma in technology products. Professor John Clarkson and Professor Ian Hosking, of the group have worked with Austrian mobile phone manufacturer Emporia to develop the Emporia ELEGANCE and SOLID. Ian Hosking explains "the great challenge to manufacturers of technical devices is to combine user-friendliness with attractiveness" [Emporia 2010]. The group has also been developing tools to enable designers to better understand ageing and impairment. A review of the effectiveness of empathy tools which suggests that they could be improved in order to give designers a truer representation of impairment and help to identify increased numbers of usability problems [Cardoso and Clarkson 2012]. Unfortunately, improvements would almost certainly increase their cost and render them less attractive to business users.

2.2 Age related impairments

Inclusively designed mobile phones must consider a range of age related impairments that affect the way older people experience their daily lives as well as use of technology. Decline to sensorial, physical and cognitive capabilities are all commonly associated with ageing. Visual impairment, including the narrowing of the visual field, degradation of colour vision and loss of acuity of movement perception are often caused by a reduction in receptor cells and can affect an older person's abilities to process, analyse and store information [Rabbitt 2005]. Ageing can also have an effect on the sense of touch; increasing a person's tactile threshold due to a drop in the numbers of receptors in the fingers [Margrain and Boulton 2005]. This may be particularly significant when considering the use of touchscreen phones. Perhaps surprisingly however, age is not the main variable affecting decline in hearing, it is thought that stronger influences include repeated exposure to noisy environments and genetic factors [Margrain and Boulton 2005]. Cognitive performance becomes increasingly variable as a person ages [Rabbitt 2005], affecting memory capabilities to varying degrees. Working memory is often the most affected by age, potentially leading to reductions in a person's ability to hold information in order to complete complex tasks such as comprehension and information storage [Maylor 2005]. Long-term memory, conversely, will often remain largely unaffected by age, meaning that older people often retain their ability to use previous experiences to perform new and known tasks [Maylor 2005]. Studies suggest that decline in some memory capacities; processing speed and spatial abilities can all significantly impact one's ability to use technology products [Kurniawan 2008].
Despite age being a main cause of impairments, impairments do not solely exist in older people and can affect many others in society. Impairments should not be perceived as insurmountable hurdles; and it is important to recognise that people, despite impairment(s), want to live as independently as possible and will often rely on technology to do so. Usability improvements for marginalised users can often also benefit mainstream users.

2.3 Lifestyle

Mobile phone ownership and usage intensity not only vary with age, but also with lifestyle and technological experience. Statistics show that use of mobile phones is significantly higher amongst younger people than older people [ILC 2009]. This trend can be explained by both exploring the effects of cognitive and physical declines, as discussed in the previous section, as well as the lifestyle of the user, including job type, previous exposure to technology and social support systems. According to a report by the ILC, in 2005 under half of people aged over 65 owned a mobile phone, which is considerably lower, by comparison, to the wider population. They also make, on average, a quarter of the calls and send a tenth of the texts. Ofcom data, published in 2011 shows that older people are much more likely to have a fixed telephone line, especially those aged over 75 or a combination of mobile and fixed telephone line, for those aged between 55 and 74.
Older people were formally educated before the widespread use of technology products and are less likely to have had regular or prolonged exposure to technology throughout their lives than younger

people. This can result in a lack of a mental model associated with common hierarchical menu structures used in mobile phones [Ziefle and Bay 2005] and can result in lower task solving abilities and overall performance (than younger users). Recognising the struggles that exist with current devices is important in order to develop phones that suit a variety of mental models.

2.4 Usability in current mobile phones

Older people often see their mobile phone as an irreplaceable communication tool [Renaud and Van Biljon 2010]. Despite usability being the most important purchasing consideration, research still shows that many older users experience usability problems when using mobile phones. These problems include the size, shape and location of buttons, screen size, menu structuring, predictive text [Kurniawan 2008] and the naming of functions [Ziefle and Bay 2005]. Other complaints include small screens that make it difficult to display large quantities of information efficiently and physical buttons that have multiple functions, which can all cause user frustration. In terms of navigation, older people often struggle to navigate through mobile devices; taking more time to complete tasks, often getting lost within the hierarchical menu structures and returning more often to the top of menu hierarchies than younger users [Ziefle and Bay 2005]. There are also practical elements to consider including the shape and weight and battery life of a device, which may be of more importance to older users than younger ones, due to dexterity and memory impairments. Unfortunately, it is difficult to test many aspects of usability prior to purchase as customers are not generally able to try out products in retail environments and therefore must rely on advice from people they know or members of staff; which can be misleading if they have not have undergone training on every device or work on sales based commission.

Reducing interface complexity reduces error rate, detours and time to complete navigational tasks [Ziefle 2002]. This has led to functional reduction and the extreme simplification of interfaces by manufacturers in order to meet the needs of the older people [Renaud and Van Biljon 2010]. There are currently a number of devices with differing levels of simplification, from 5 button devices, with pre-assigned numbers, to some that closely resemble mainstream phones, but with louder ring tones, panic buttons and larger screens, buttons and text. 5 button devices, such as the Easy 5 (http://easytousephones.com/shop/page/7?shop_param=), allow users to assign each keypad number to a loved one's telephone number, as with speed dial. Whilst it is important to recognise that some older users will want a device that offers such extreme simplicity, for others these phones will frustrate and confuse. In the case of the Easy 5, the design requires users to remember number person pairings, which requires the very processing skills that is assumed older users do not possess. Also, having to remember the number assignments in everyday life may not be difficult, they can be written down for example, but under stress or in an emergency this information may be more difficult to recall or retrieve [Renaud and Van Biljon 2010].

3. Method

The aim of the study protocol is to evaluate the design of existing phones against the approach's hypotheses in order to establish whether the hypotheses represent a reasonable alternative to current solutions. If this is proven to be the case then qualitative data will form the basis of a set of requirements for a new empowering design that embodies the hypotheses. Qualitative research techniques are essential in order to gain a detailed insight into decision making processes, establish the relevance of participants' opinions and gauge reactions to questioning and interactions with devices. The study will also provide information regarding mobile phone usage patterns, preferences and experiences. Participants will be asked to perform tasks on a given mobile phone; these tasks will be observed by the researcher, who will note common successes, difficulties and areas for further study.

3.1 Participants

Informal interviews will be undertaken with approximately 45 participants, with a variety of ages over 60, who already own and use a mobile phone semi regularly (semi regular use is defined as use of a mobile phone at least once a week). Participants will be required to be able to perform the following tasks (but will not be tested on the tasks in the session):

1. Switch a phone on/off
2. Lock the keypad
3. Make a call
4. Find a number in the phone's directory.

Therefore, people who only receive calls on their mobile phones will not be eligible for the study. The chosen age range reflects a significant age span within the older age group who may have had limited exposure to technology. Participants will be sorted into age brackets, around 10-12 participants for each of the following age categories; 60-64, 65-69, 70-74 and 75-80. An equal number of male and female participants will be sort in each age category. Selection will not be based on educational background, although background will be tracked against performance. Participants will be recruited from local Age UK resource centres in the London area.

3.2 Procedure

Interviews will be conducted informally, lasting around an hour and will take place in either a private room, or in a quiet corner of a communal area in each of the chosen Age UK resource centres. Each interview will consist of two parts:

- Part 1: Questions to understand usage patterns and lifestyle
- Part 2: Tasks on one mobile phone in order to understand the way that users navigate existing phones.

Part 1: Questions will be asked in order to investigate the hypotheses; 2. That people have diverse abilities, needs and aspirations, 3. That based on life experience, people are generally capable of making satisfactory choices. Questions will focus on; lifestyle, frequency, pattern of use, the functions they are familiar with and purchase decision making. The answers to these questions will provide qualitative data to inform these two hypotheses. Questions will then be asked about other areas of phone ownership, such as choice of aesthetics and functions as well as customer service requirements and expectations, in order to inform the hypotheses; 4. People deserve desirable, intuitive and stigma free products and 5. Most people are capable of reviewing and modifying choices.

Part 2: Participants will be asked to perform a series of tasks on a device in order to determine whether current phones allow participants to perform basic tasks, use task-based knowledge to complete more complex scenarios and enable users to recall the navigational map used to complete each task. These tasks will explore whether existing phones allow users to learn new skills at their own pace; the first hypothesis in our design approach. Sessions will be voice recorded and participants will be asked to think aloud whilst undertaking each task. The number of users' operations (e.g. button pushes or swipes for each task) will also be noted; including any navigational errors, returns to previous menus and detours. After each set of tasks the participants will be asked to reflect on satisfaction levels and describe difficulties faced.

After the initial interviews, a small number of participants will be asked to take the phone they tested home, with a small amount of credit, in order to provide a longer-term assessment of each phone. They will be telephoned and texted during this period to prompt usage. After these longer exposures, participants will be asked to return for a follow up interview to discuss the week, carry out further tasks in order to understand whether they have developed skills on the particular phone and measure their satisfaction level. The prolonged exposures will further test the first design hypothesis that users are capable of learning new skills at their own pace.

3.3 Device selection

Phone selection will be based on phone and navigational complexity; the average number of menu levels that must be navigated to complete a task and the average number of keys necessary to complete a task [Ziefle 2002]. Phones will be selected across a range of types, including smartphones, 2G phones and phones specifically marketed at older people.

4. Discussion

The proposed hypotheses aim to encourage an inclusive approach to design, that looks more carefully and sensitively at the diverse needs of people within our society. This approach will be used to create innovative and flexible products that serve the needs and aspirations of as many people as is reasonably possible. One way that technology products can do this is to support older people in living autonomously, one of their highest priorities. Designing technology for older people is therefore not simply about satisfying their cognitive and physical needs, instead successful technology products minimise frustration, create a feeling of task satisfaction, include and involve people in society, allowing them to live independently and stigma-free.

The ways that people of all ages represent themselves is changing; increasingly, people are placing more emphasis on the products they own as a means of expressing their personality and identity, 'one could say that people have become products of their products' [Oritsland and Naess 2005:2]. The aesthetic value of consumer products is therefore becoming increasingly important to all, so the apparent lack of aesthetic consideration of many products aimed at older people prevent them from becoming aspirational products. Unfortunately, despite the potential for technology to improve the lives of older people it is proposed by some to often work against them, for example, technology that aims to reduce human dependency will, by its very definition, create an increased dependency on technology, which could possibly lead to increased loneliness and isolation. It is crucial for technology products designed for older people, like for anyone else, to offer functionality, dignity and beauty [Oritsland and Naess 2005].

This approach is based on the premise that design for older people too often relies on assumptions without proper investigation of real needs and aspirations. Whilst often well intentioned simplification often offers many neither flexibility nor knowledge expansion. This research proposes that the key to improved usability and inclusivity is the relationship between the phone's physical design and the internal structuring of information. Increased button and text size and a clear screen will often help people use a mobile phone more effectively, but minimising frustration and increasing user enjoyment will come through a combination of improved physical design and logical and intuitive menu navigation.

'Easy to use' phones tend to focus on the physical aspects of the phone's design, such as increased keypad button size, the introduction of personal alarm buttons and the removal of features, whilst often neglecting the internal information architecture of the phone; leaving many phones with deep menu hierarchies, confusing menu names and buttons multiple functions. These problems can cause low users, including older people to struggle to use the basic functions of their mobile phones. Improvements to both of these elements would allow users to use their phone's basic functions more easily and build other functions into the phone, over time. Therefore, by focusing on improving the user's journey through the phone, designers and manufacturers can create products which allow users to develop and improve their skills over time in order to add functionality over the phone's lifespan.

Too often businesses fail to understand the needs of the wider population and instead market products to those who are young and able, resulting in products which are neither desirable nor fully usable by those with more complex needs. It seems that many forget the adage 'design for the young and exclude the old, design for the old and include the young'. The creation of products based on the proposed hypotheses could benefit several major stakeholders; individual users, businesses and society in general. Benefits to older people have been discussed throughout this paper but to conclude; these hypotheses could result in increased product satisfaction and empowerment as well as possibly decreasing isolation. Taking a wider look; given the choice, the majority of older people would rather continue to live in their own homes than move to sheltered or residential care facilities, for practical, social and financial reasons. Personal choice coupled with the rising cost of social care mean it is essential to enable independent older people to remain at home for longer. This can be achieved with the help of intuitive and flexible technology products which support their needs more effectively than current offerings. Due to the size and wealth of the older market in the UK, which is estimated at £280bn, it can also be strongly argued that the development of products that better suit their needs and aspirations would result in larger and wider markets for businesses' goods. This, in turn, could help mitigate the effects of the current retail slowdown.

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