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Designing Mobile Phone Interfaces for Age Diversity in South Africa: “One-World” versus Diverse “Islands”

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Abstract. Designing for diversity is a laudable aim. How to achieve this, in the context of mobile phone usage by South African seniors, is a moot point. We considered this question from two possible perspectives: *universal* (one-world) versus *focused* design (designing for diverse “islands” of users). Each island would be characterised by a measure of relative homogeneity in terms of user interface needs. Our particular focus in this paper is age diversity. The universal approach attempts to deliver a design that can be all things to all people – meeting the needs of all users within one user interface. The islander approach delivers specific and different designs for islands within a diverse world. To determine which the best approach would be, in the South African context, we dispatched a team of student researchers to interview participants from an older generation, on a one-to-one basis. It was beneficial to deploy aspiring designers to carry out this research because we wanted to confront aspiring researchers with the differences between their own and other generations’ usage of, and attitudes towards, mobile phones. Our study found that there were indeed significant age-related differences in mobile phone usage. Our research delivered insights that led to a model of the factors impacting mobile phone usage of the senior generation as a series of *filters* between the user and their device. We conclude that the island approach is more suitable for age-specific design. This approach might well become less fitting as a more technologically experienced population ages, but at present there is a clear need for an age-sensitive mobile interface design.

Keywords: Mobile Phones, Design, Age

1 Introduction

The world is a-changing, in different ways and at varying paces. One technology that has changed lives across the planet with dizzying speed is the mobile phone. These devices have become so interwoven with our daily lives that it is hard to imagine a world without them. Indeed, people object when they are denied their phones, even for short periods, evidenced by opposition to the ban on usage during take-offs and

landings of airplanes [1]. Interestingly, there are now calls for this ban to be lifted [2]. Our focus in this paper is generational impact on the use of mobile phones, and how this ought to be accommodated in the design of phone interfaces.

Many countries world-wide are grappling with a shift from a demographically young to a demographically old society and the challenges this constitutes in terms of care and having enough young people to finance pensions. This has been a relatively slow but inexorable shift as birth rates have declined and health advances have prolonged life spans. The breakneck speed at which technology has advanced in the same period is something the older generation often finds daunting.

The diffusion of mobile phones into society provides a powerful example of the rate of change the elderly have witnessed in their lifetimes. Whereas it took 95 years for 90% of American homes to get landline phones, it took only 20 years for mobile phones to penetrate the market to the same extent. The young of today are used to this rate of change [3]. There is evidence that the older generation experience particular and challenging difficulties using this mobile technology [4] [5]. Children use mobile phones intuitively [6] but for older users it often seems an alien device [7].

A Google trends search for “senior phone” delivered the graph in **Fig. 1**, which suggests that there is an increasing and sustained interest, worldwide, in mobile phones for the older user. What is not yet clear is what approach should be taken to accommodate the needs of this growing user group.

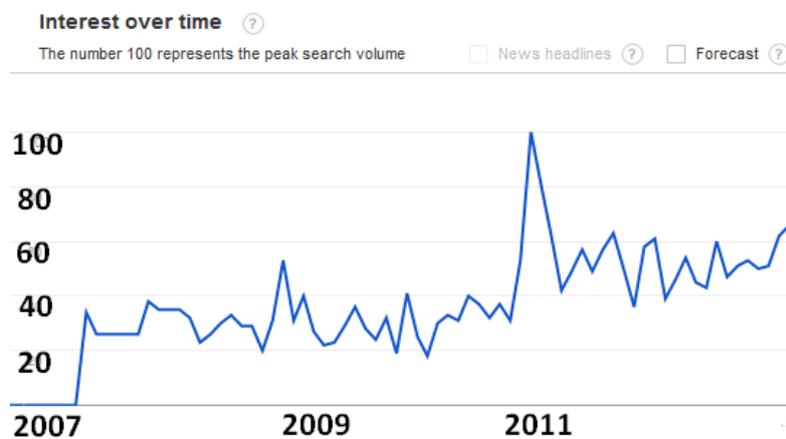


Fig. 1. Google Trends Search for the term “senior phone” carried out 15 January 2012 (<http://www.google.com/trends/explore#q=%22senior%20phone%22>)

The rest of this paper is organized as follows. Section 2 contemplates the different approaches to designing for diversity. Section 3 presents the design of the study we carried out to determine whether there is a need for an age-sensitive approach to designing mobile phone user interfaces. Sections 4, 5 and 6 detail the three distinct parts of the research, the first carried out by the student researchers, the second the conclusions about mobile phone usage by the young and the third modeling mobile phone

usage by the older participants. Section 7 discusses the findings and Section 8 concludes.

2 Designing for Diversity

It is beneficial to ensure that we set out with a clear understanding of the core concept of diversity. Synonyms for diversity are *variety*, *multiplicity* and *difference*. These suggest designing for ease of use without the expectation of the user having any specific set of skills or prior experience. Users have goals and needs and wish to use the interface to satisfy them: they do not wish to have to undertake training, read manuals or to struggle to use the device. There are at least two ways of designing for diversity.

- The first is to design a *universal* interface offering a wide range of functionality and personalisation features. This option accommodates a wide range of needs and wants, being all things to all users and is followed by smart phone manufacturers. The owner of the smart phone can tailor the phone to their own personal tastes and needs, with a myriad of options and settings available to facilitate the process. Many mobile phones allow the owner to choose a ring tone, background, layout and set of applications, and is referred to as the *one-world* approach [8]. The snag might be that we run the risk of not meeting anyone's needs properly, of delivering the same sub-optimal interface to everyone.
- The second option is to perform *segmentation*, to provide a range of interfaces and devices, each focused on satisfying the needs of a specific group of users. This approach assumes that users can indeed be segmented into islands of relative homogeneity. The users within these islands are considered to share more characteristics with fellow islanders than they do with the inhabitants of other islands, but within each island there is still much diversity. This can be referred to as the *island* approach. This option can have negative connotations and be considered discriminatory. To address this, islands have to delineate with great sensitivity and care. This approach is argued for by Head & Ziolkowski who proposed segmenting mobile phone users in a meaningful way and moving beyond the "one-size-fits-all" model [9].



Fig. 2. Eliminating Complexity by Reducing Functionality (The Age UK Mobile Phone on the right)(<http://www.ageuk.org.uk/Products/Communications/Mobile-phones/>)

Which approach should be followed in designing mobile phone interfaces for age diversity, the *one-world* or the *island* approach? Prensky makes a strong case for designing for age-based groups [10]. **Fig. 2** (left) offers an extreme example of the most popular way of solving difficulties experienced by the elderly: withdrawing and reducing functionality to the bare minimum. As with many other seemingly quick and easy solutions to intractable problems this approach is amusing rather than effective since it severely reduces the usefulness of the device. Some mobile phone manufacturers have indeed identified the elderly as a group justifying the island approach. Most of the “senior” phones on offer provide severely reduced functionality and almost child-like interfaces (see **Fig. 2** -right). The underlying assumption is unpalatable: the elderly are incapable or don’t need all the functionality other users need. While the island approach might well be justified, they appear to have failed in their execution because these phones do not accommodate the diverse needs of all “island” members, and might actually alienate some with their simplistic design.

The failure of the mobile phone industry to meet the needs of older users with their targeted device and interface could be due to the island approach, as a concept, being a fallacy, at least as far as age is concerned [11]. It could also be because the design has veered too far towards an unwarranted assumption of island homogeneity, not acknowledging islander diversity.

The viability of a generation-sensitive island approach, rather than a one-world approach, needs to be studied in order to determine how to design mobile phone interfaces to accommodate the a wide range of generational diversity.

2.1 Purpose of the Study

Our aim is to reveal diversity or homogeneity within and between generational “islands”, with the end purpose of approving or denouncing generation-specific design. It could be that there are no, or merely shaky, grounds for the island approach [11]. The evidence might well convince interface designers that the one-world option is the wiser. An ethnographic study will help to deliver this insight.

2.2 Researcher Choice

The critical question is: who should undertake such a study? One of the main concerns is that whoever does the study will be influenced by the natural human tendency to stereotype older people. We all have a tendency to assign people to classes or categories and then to exercise judgement based on this categorisation [12]. This is particularly true of age-specific groups, since age is immediately apparent when we meet someone for the first time. Cuddy and Fiske also point out that “out-groups” (as the young would consider the old or *visa-versa*) are seen to be homogeneous. In terms of how the young see the elderly, this leads to expectations of competence (low) and friendliness (high). Thus two observers might interpret the same incident very differently, especially when they come from two different generations.

A researcher might have an unconscious bias towards the island population, which would influence their interpretation. It is important for the reported findings to be

validated, to ensure that they are not merely the product of pre-conceived notions. Fortunately, Caspi reports that inter-age contact serves to reduce stereotype-like attitudes [13]. Moreover, ensuring that individuals from two distinct groups interact has been shown to reduce stereotypical characteristic attributions [14]. Thus, if we incorporate inter-generational contact, on a one-to-one basis, into the study, we can reduce the stereotyping effect. This will lessen the likelihood that researchers merely report pre-conceived notions rather than real effects.

There is another way of contemplating age-specific research. Neugarten, Moore and Lowe argue that older people are more aware of age-appropriate behaviours than are younger members of society [15]. Thus the younger do not have invariant expectations of age-specific behaviour, as do the older. This means that, in contrast to the stereotyping perspective, which suggests pre-conceived expectations, this perspective suggests that they would not have as strongly held behavioural expectations as the older participants. This might make them more open to contemplating the situation as it is, as opposed to merely confirming their own pre-conceived notions about what people of the older generation do and think.

Hence it made sense to dispatch trainee user interface designers to carry out this research. This delivered other benefits too. Where clearly we would like to confront seasoned designers themselves with the findings of this study, it is even better to task designers themselves to carry out the study. This kind of engagement is a very valuable way of exposing interface designers to the needs and opinions of a group of users they wouldn't normally encounter. Moreover, it would be especially valuable for aspiring user interface designers to experience this at the outset of their careers before they establish less than helpful design habits and become less malleable and more likely to hold pre-conceived notions [16].

There is another consideration too. In previous eras the older generation trained and apprenticed the young; they had something valuable to impart, which suggests that the young respected and learnt from them. There is worrying evidence of a shift in attitude. Netz and Ben-Sira asked a range of generations to rate adolescents, middle-aged and elderly people on four semantic categories [17]. All participants rated the "older" category lowest of all the semantic categories. Sharps, Price-Sharps and Hanson compared attitudes to the elderly in Thailand and America and their study confirmed these kinds of negative attitudes towards the elderly in both countries [18]. The widespread use of the word "ageism" is perhaps the most prescient reminder of the fact that the elderly are increasingly considered a burden to society, displacing them from their erstwhile strong position of respect and source of sage advice. Going back to our previous discussion about stereotyping, and the benefit of ensuring that individuals from different groups meet each other, it would seem helpful for students to carry out the research so that a sense of mutual respect can be fostered.

Hence we decided to set this as a task for students, aspiring human-interface designers, to carry out as coursework. The student researchers can undeniably deliver a different and fresh perspective, delivering potentially new and different insights since they are not constrained and influenced by their previous designs and activities,

3 Study Design

The study was structured as shown in **Fig. 3**. In stages 1 and 2 we set coursework for students undertaking a third-year Computer Science Human Computer Interface course. They were to interview an older mobile phone user about their use of their mobile phones and to teach them how to use a function on their phone. They had to assume that a mobile phone company, wanting to target the over-65 market, employed them.

The students were required to submit a joint report detailing their findings and making recommendations for improvement of the device and/or interface. We provided the framework for the interview to ensure that all students investigated the same aspects. This questionnaire addressed: background information about the participant, their mobile phone experience and usage, and how they felt about their mobile phones. No personal information was collected so anonymity was preserved. To familiarise students with ethical practice they were instructed to ask the participants to complete a consent form prior to the interview. We confirmed their findings by carrying out a search of relevant academic publications reporting the findings of empirical studies in this area.

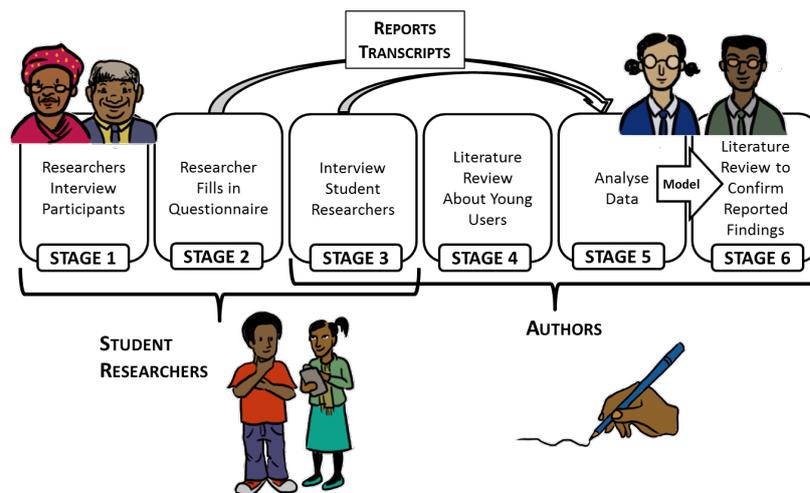


Fig. 3. Study Stages

In stage 3 we instructed the student researchers to also complete the questionnaire so that we could carry out a comparative analysis. We also interviewed the students to gather qualitative data to support stage 4. In stage 4 we consulted the academic literature to establish an understanding of their typical attitudes to, and use of, mobile phones. During stages 5 and 6 the reports, questionnaires and interview data were analysed qualitatively and quantitatively. The analysis of the qualitative data supported identification of similar or contradictory themes [19].

4 Stages 1 and 2: Student Researchers' Reports

Fifty student researchers collected data from 99 participants (aged 65 years and older). The students were asked to recommend changes to the interface design that could improve mobile phone usage. Case sampling was used to select the participants “where a profile of attributes or characteristics that are possessed by an ‘average’, typical person or case is identified, and the sample is selected from these typical people or cases” [19, p. 143]. To explore their participants’ experience of their mobile phones, they interviewed the participants using a standard questionnaire of 65 questions developed by the authors. Students sometimes found it difficult to find willing participants for the project but a few students obtained permission to interview residents in retirement villages or homes. Those with relatives in the vicinity mostly interviewed family or family friends. Most student interviewers interviewed a friend or acquaintance (see Fig. 4).

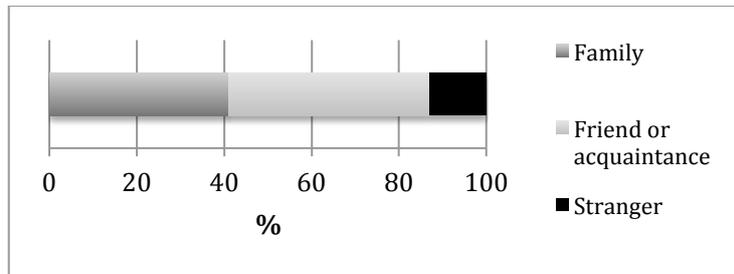


Fig. 4. Students' relationship to their participants

4.1 Questionnaire results

The older participants were mostly unskilled (42%), although 37% were skilled, 11% were retired and 9% were unemployed. The majority (37%) of the participants had between 6 and 12 years of schooling (see Fig. 5).

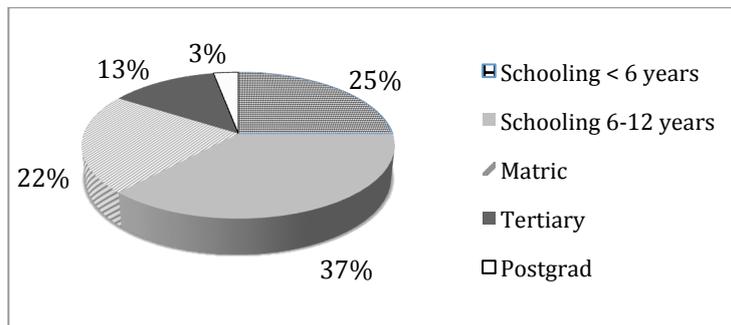


Fig. 5. Highest qualification of elderly participants

Significantly more students indicated that their English (reading and writing) skills were very good ($X^2 = 30.95, p < 0.0001$) ($X^2 = 13.53, p = 0.0012$). Students used their cell phones more regularly than the older generation ($X^2 = 18.58, p < 0.0001$). Although 65% of the participants indicated that they enjoyed their phones, more students (97%) indicated that they enjoyed their phones ($X^2 = 15.93, p = 0.0003$). More students also indicated that they always kept their mobile phones within reach ($X^2 = 10.78, p = 0.0010$). As expected, students are more likely to use abbreviations when writing SMSs (85%) ($X^2 = 51.70, p < 0.0001$). Students were more likely to have smart phones (91% versus 31%) than their participants ($X^2 = 45.50, p < 0.0001$). Significantly more students found the mobile phone easy to operate, enjoyable, appealing and friendly compared to their participants.

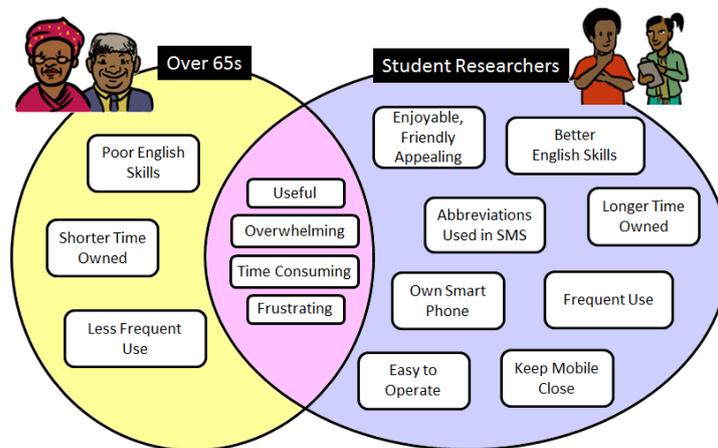


Fig. 6. Similarities and differences

A statistically significant number of participants found the mobile phone confusing at times. Phones were obtained from similar sources and charged similarly.

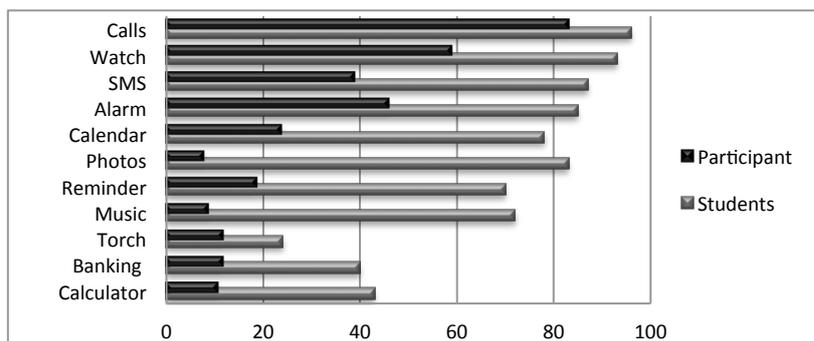


Fig. 7. Phone functions used indicated as a percentage

No differences were found between the two groups in terms of their feelings of frustration when operating the phone or it being overwhelming or time consuming. A summary of all the findings is depicted in **Fig. 6** and can be seen in Table I in Appendix A.

Phone usage, as expected, was very different in the two study groups – all functions, except calls, were used statistically significantly more regularly by students than the elderly participants (see **Fig. 7**). Both groups found the mobile essential, useful, liked the phone, indicated that it made life easier and that it offered value for money (see **Fig. 8**). Similarly both groups indicated that there were some aspects of their mobile phones that they would like changed/improved. These included: the keyboard, the screen, the camera and other aspects such as sound quality and increased battery life.

5 Stages 3 and 4: Literature on the Younger Mobile Phone User

The young seem totally at ease with their mobile phones, almost considering the device to be an extension of themselves. To understand how the young feel about their phones we asked students to fill in the same questionnaires the participants completed. From this, a number of themes emerged, related to how they felt about their phones. The research literature confirmed these themes (see **Fig. 9**):

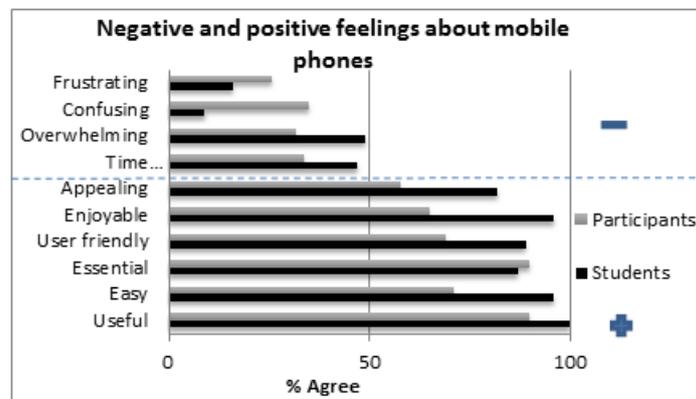


Fig. 8. How participants and students felt about their mobile phone

1. **Use Frequently & Keep their phones close:** Walsh, White and Young found evidence that the young are extremely attached to their phones, exhibiting symptoms of addiction [20]. They use their phones to enliven “dead time” while commuting or queuing, to maintain a sense of awareness of others not in the same location and use the phones to finalise arrangements for meetings in real time [21]. Both Park and Wikle argue that some users become addicted to their mobile phones [22] [23]. If this happens, the device will easily become characterized as **time-consuming**.

2. **Enjoyable, friendly, appealing, useful:** in terms of these aspects it is difficult to know which comes first, the mobile or the prospect of enjoyment. Dickinger, Arami and Meyer suggest that the prospect of enjoyment drives adoption [24]. Once they start using the phone, it is likely that their enjoyment will lead to more usage, with enjoyment and usage reinforcing each other, leading to whole-hearted adoption [25].
3. **Frustrating, overwhelming:** This was an unexpected result: that even the young sometimes experience negative feelings towards their phones. Thompson, Hamilton and Rust refers to *feature fatigue* being experienced by mobile phone users, which might be what these students are experiencing [26]. This aspect is confirmed by Head and Ziolkowski [9].
4. **Emotional Attachment:** It is interesting to note that young people consider their phone as a way of expressing their sense of self and use it as a fashion statement [27]. Vincent investigated emotional attachment to mobile phones, and suggests that its multiple roles and the activities it facilitates play a role in this attachment [28].



Fig. 9. Young people and their mobile phones

Many of these findings were also confirmed by the Pew Internet survey of mobile use by teens in April 2010 [29]. What is interesting about this collection of themes is the apparent contradiction between approbation and opprobrium. The students rely on and use their phones frequently, but some still express a sense of being overwhelmed by their phones and admit to a measure of frustration. Nafus and Tracy carried out a longitudinal study into the use of mobile phones in the UK. They found that teenagers in their study were very enthusiastic about their phones, but that attitudes changed after 20, with some participants expressing outright hatred of their phones. They acknowledged the usefulness of the phones but had reservations about their negative social consequences. The authors postulate that the ubiquity of phones challenges their emerging sense of individuality. They report that the over-30s in their study appeared indifferent to their phones. It could be that our students, in the 20-30 age

group, are in the process of shifting away from unqualified enthusiasm to a more mediated utility-oriented usage of their phones [30].

6 Stages 5 and 6: The Younger Generation's Reports about the Older Mobile Phone User

Team reports, as well as interviews, were used to gather qualitative data. A grounded theory approach was used to analyse the reports: no pre-conceived themes were used to guide the analysis: the analysis allowed a number of dominant themes to emerge from the text. All comments referring to the elderly and the challenges they faced in using and learning mobile phone functions were extracted, and categorised.

The themes that emerged suggest a pipeline-like filtering process between the phone, its myriad capabilities and functionalities, and the elderly user. It became clear that reduced functionality was a very strong theme. Some comments suggested that this was affected by the complexity of the interfaces but for some functions the strength of the need for use of the functionality provided sufficient impetus for mastery of the function, despite difficulties. Another strong theme was that of age-related impairment. All reports mentioned at least one of visual, auditory or dexterity impairment, which made the use of the phone challenging for the elderly participants. Some also referred to age-related memory difficulties. Another anecdotal theme was related to the perception that the participants appeared to learn more slowly than the researchers did themselves. There was the sense that this was impeding their use of the mobile device. There was also mention of education, gender and location effects on usage. A final strong crosscutting theme was that of change resistance and mistrust, with many of the participants being averse to changing the way they did things. Fig. 10 presents the themes as funnels, or filters, which intrude between the phone and its owner, making the device less useful and usable than it could be.

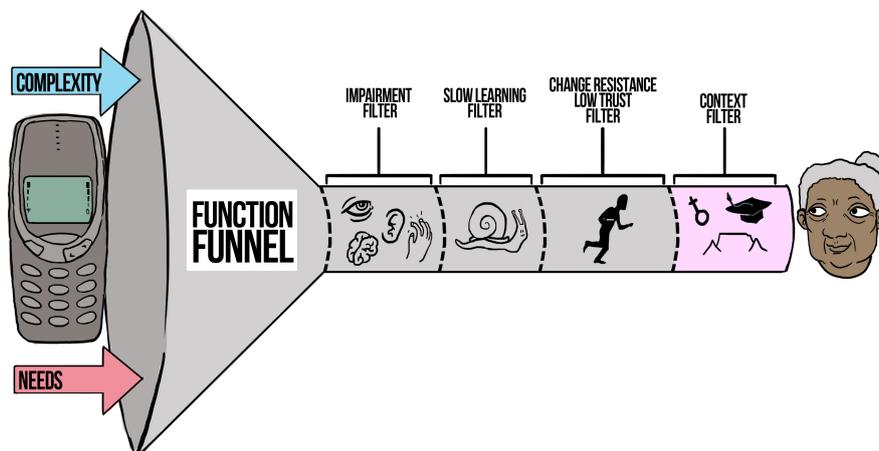


Fig. 10. Factors impacting on older mobile phone users

There is conflicting evidence in the literature about the impact of education on usage, such that we also cannot confirm that education, by itself, impacts older mobile phone users' use of their mobile phones [31] [32]. The former study detected no educational effect while the latter did. Bagchia, Kirsa and López [33] also did not find an educational effect on ICT diffusion, yet Lee did observe an educational effect [34]. Finally, Boateng carried out a study of micro-traders in Ghana and was not able to show any educational effect in terms of mobile phone usage [35]. It seems that one cannot reliably isolate the effects of education in impacting technology usage. Education, or lack thereof, like gender, is also a strong indicator of socio-economic status in Africa. Interestingly, the students also referred to a location effect. When the students referred to "location" they were probably referring to the areas participants lived in that reliably (in South Africa) serve as an indicator of their socio-economic standing. Rice & Katz were indeed able to confirm that this impacts mobile phone usage [36]. This, too, is confirmed by the Unicef report on the use of mobile phones in South Africa. Hence the gender, location and educational effects reported by the students arguably all fall under the socio-economic status umbrella, and this has indeed been shown to impact on mobile phone usage.

There is clear evidence confirming the other factors reported by the student researchers. There is confirmatory evidence of older mobile phone users making use of a small subset of core functionality [37], and that their usage is determined by their needs [38]. Turner, Love and Howell found evidence that older users did indeed use their phones less than younger users [39]. Ziefle and Bay found evidence that the complexity of the provided functions often discouraged older users from using them [40]. There is also evidence of age-related impairments getting in the way of their use of the phones [41] and there is evidence that they do indeed appear to learn more slowly than their younger counterparts (Holzinger, Searle & Nischelwitzer, 2007). They also resist change [42] and many mistrust technology [43].

Hence most of the identified factors are confirmed, suggesting that the students did indeed reliably identify age-specific difficulties in the use of mobile phones. The refined model is shown in **Fig. 11**. The ordering of the filters is not intended to be relevant or prescriptive. The relative impact and ordering will be individual-specific.

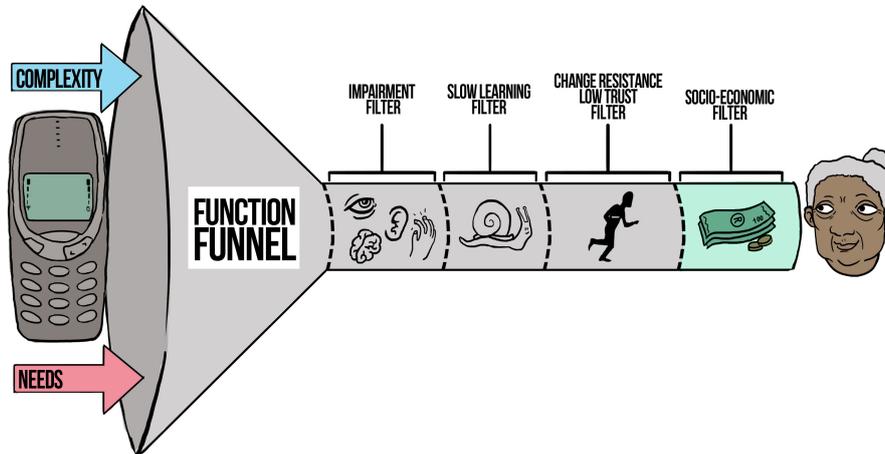


Fig. 11. A model of the factors that influence mobile phone usage by older users

7 Discussion

There are striking differences between young and old in terms of their use of, and attitudes towards, mobile phones. Whereas the older generation appear to struggle with the phone interface and multiple functionalities, what is conspicuously absent from the literature is any mention of difficulties being experienced by young people using their phones. There were no reports of perceived complexity or any sense of their being put off by the speed of technology advance – they embrace the new opportunities these advances open up. Kreutzer carried out a study of the use of mobile phone features by high school children in the same part of South Africa as this study. He reports that, during one particular day, almost all students used phones, even those who did not own phones themselves. The most used aspect was personal communication, but the second most used functionality was related to entertainment (games, music, photos, videos). This type of use is very rare amongst the older participants [44].

The older generation, on the other hand, were cautious, mistrustful, almost censorious. They owned and used their phones but there was no sense that they enjoyed them the way the young did. They used them purely in a goal-directed fashion to satisfy their needs. Fernández refers to mobile phones having a peripheral position in the older person's life, which is very different from the way young people view their mobile phones [45].

Yet there were similarities between generations. Both groups found the mobile phone useful, suggesting that it supported their goal-directed needs. Conci, Pianesi and Zancanaro surveyed 740 older people and found that their mobile phone usage was primarily utilitarian driven, which appears to confirm this. The motives that drive

older users to use mobile phones, they argue, are much the same as those that drive younger users [46].

We will conclude this section with a note of caution. It would be foolhardy to assume a high level of homogeneity within island groups. For example, Aoki and Downs analysed college students' use of their mobile phones and identified five groups within their sample, displaying very different attitudes towards their mobile phones even within a group of fairly similar age, interest and educational level. In designing for "islands" we have to ensure that we identify the shared characteristics, and design to accommodate those, but the design must also be sufficiently flexible to accommodate the wide diversity *within* the generational island [47].

8 Conclusion

Daniel and co-researchers argue strongly for an understanding of context (social, economic and political dynamics) of ICT usage before any intervention is contemplated [48]. Here we have studied the use of mobile phones by the older population in South Africa, precisely in order to understand this context. We contemplated two approaches in this paper: designing for *one-world* or an *island-specific* design. We were able to depict the experiences (**Fig. 7**) and attitudes (**Fig. 8**) of the young researchers and the older participants and the differences are prominent and conspicuous. What we see is the older users grappling with a new and unfamiliar technology that often seems to overwhelm them with its complexity. We see usage of a reduced range of functionality and a measure of frustration at an inability to master this device that seems to mean so much to the younger generation. The young, on the other hand, appear to love their phones, use them constantly and seemingly couldn't do without them. Would it be possible to produce one design for these two groups? We do not believe this to be feasible or practical. In terms of age-sensitive mobile phone design, especially in a developing world context, we therefore argue that island-specific design is the wiser approach.

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Appendix A

Table 1. Elderly participant and student comparisons

Variable	Options	Participants	Students	X ²	p-value
Resident	City	65	46	4.94	0.0848
	Small town	21	36		
	Rural	14	18		
English reading skills	Not well	18	0	30.95	<0.0001**
	Reasonably well	42	11		
	Very well	40	89		
English writing skills	Not well	21	0	13.53	0.0012**
	Reasonably well	36	32		
	Very well	43	68		
Length of mobile ownership	< 1 year	6	2	8.94	0.0115*
	1-3 years	22	4		
	3+ years	72	94		
How was mobile obtained	Bought	49	56	3.20	0.3612
	Gift	43	33		
	Contract	6	11		
	Other	2	0		
How often is mobile used	< Once per week	11	0	18.58	<0.0001**
	Once a day	24	2		
	> Than once a day	63	98		
Keep mobile close	Yes	80	100	10.78	0.0010**
	No	20	0		
How mobile is charged	Home battery	17	15	3.17	0.3667
	Electricity	83	85		
Abbreviations used for SMS	Yes	21	85	51.70	<0.0001**
	No	79	15		
Phone enjoyable	Agree	65	96	15.93	0.0003**
	Not sure	23	2		
	Disagree	12	2		
Phone frustrating	Agree	26	16	2.34	0.3102
	Not sure	18	15		
	Disagree	56	69		
Makes life easier	Ambivalent	3	3	0.78	0.6761
	Yes	95	97		
	No	2	0		
Suggested changes to phone	Nothing	38	19	6.16	0.1879
	Keyboard	15	23		
	Screen	17	16		
	Camera	6	12		
	Other	24	30		
Own a smart phone	Yes	31	91	45.50	<0.0001**
	No	96	9		

Significant result $p < 0.05$; **Very significant $p < 0.01$