Articles

Granny Gets Smarter but Junior Hardly Notices

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To ensure that university computing students are sensitized to the needs of diverse user groups, a course project was designed to allow students to get a realistic understanding of the needs and abilities of the older mobile phone user. Over a three year period different student cohorts interviewed these users to assess their experience with mobile phones. It was found that students were generally dismissive of the cognitive abilities of the older mobile phone user. However the yearly snapshot revealed that the older user's abilities improved year on year. Being prepared to understand all user groups is an essential skill that should be acquired by future interface designers.

Introduction

South Africans in the over 65 age group are in the minority (5.5% of the population - 2014) (Statistics South Africa, 2014). Minorities are easily side-lined in any context, but particularly in an unequal country like South Africa (Gini Index 63.14 in 2009)[1]. Moreover, many older South Africans, due to having grown up under apartheid and mostly having lived in rural areas with little access to services, are functionally illiterate (Aliber, 2003).

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[1] http://www.tradingeconomics.com/south-africa/gini-index-wb-data.html

The mobile phone has dispersed rapidly in South Africa due to the lack of landlines in rural areas and informal settlements (Aker & Mbiti, 2010). This has been liberating for older citizens, enabling them to stay in touch with relatives and friends across the globe. For the illiterate who used to have to wait for people to come and visit them to communicate, the mobile phone has quickly become an essential helpmate (Cuddy & Fiske, 2002) (Nickerson, 1998) (Caspi, 1984) (Erber, Etheart, & Szuchman, 1992) (Lim, 2010) (Newell & Gregor, 2000) (PewResearch, 2014).

Yet the mobile phone interface is seldom designed with the older user in mind (Renaud, Blignaut, & Venter, 2013), (Van Biljon, Renaud, & Van Dyk, 2013). So, on the one hand the mobile phone has the potential to make a huge difference to the older citizens of South Africa but, on the other, a lack of age-sensitive design means that they are not able to benefit fully from the available functionality. Mobile phone interfaces are designed by the younger generation, and the designers of the future are being trained at universities right now.

It is essential for designers to be sensitive to the needs of user groups unlike themselves, especially older people, since "*Age is the only social category identifying subgroups that everyone may eventually join*" (North & Fiske, 2012, p. 982). Improving intergenerational understanding and empathy is vital.

It was therefore decided to investigate whether students have realistic expectations of the cognitive abilities of the older population. Without a realistic understanding of the needs and skills of this demographic they are bound to design suboptimal interfaces for these kinds of out-groups. The research reported in this paper strove to improve inter-generational understanding, so as to improve aspiring designers' understanding of special needs groups.

A study carried out to explore student perceptions of the older mobile phone user found that the students were generally dismissive of the cognitive abilities of the older population. An intervention was carried out for three years in a row – constituting three snapshots with different student bodies interviewing different older mobile phone owners.

The students accepted that older adults could and did learn and make steady progress, perhaps more slowly than they themselves do. Many of the students were not prepared to acknowledge this reality, preferring to cling to their negative pre-conceptions, perhaps because they found the teaching experience frustrating. Some of the older people were rather afraid of their device, something the students could not fathom. Their exasperation is unlikely to result in a design that will be useful to the older person. On the other hand, in some cases this one isolated experience was enough to change perceptions about the needs and capabilities of the older members of the community.

In the following section the related literature is discussed. This is followed by an explanation of how the research was carried out, and then we report on our results. The paper concludes by suggesting how a larger percentage of trainee designers might be sensitized to the needs of different users and age groups.

Older Adults Learning

Many people consider that aging diminishes the ability to learn (Page, Olivas, Driver, & Driver, 1981)[2]. This is an unwarranted and unfortunate perspective. Young and old brains are tailored for different activities and specialized for their function at a particular stage of life. Young brains are designed primarily to cope with the new: they encounter new information and experiences on a daily basis and they have to be able to cope with this. Their brains have to be able to make sense of things as they go along and to learn from them quickly. In time, the brain develops heuristics, "patterns", based on repeated experiences of the same type over time (Tversky & Kahneman, 1974). Older brains have accumulated vast numbers of these patterns and are able to match these to experiences they encounter. The use of heuristics is energy efficient and the effortful processing of new experiences without the heuristics is very expensive in terms of energy. The young process more speedily because they need to do this in order to build heuristics. The aging brain, having many accumulated heuristics to draw on, is more sophisticated, not less able. In summary, while the young learn more quickly, the older brain uses past experiences to find a matching pattern. Elkonen Goldberg calls this phenomenon the wisdom paradox (Goldberg, 2007). The younger brain has the raw processing power it needs to build new heuristics quickly for use in later life: the young brain is agile; the older brain is wise.

The problem with technology is that the older brain of the early 21st century does not have appropriate existing patterns to deal with new technologies (Lim, 2010). Their existing and well-established patterns do not match this unprecedented new situation. For example, consider William, a prototype 80-year-old living in South Africa in 2014. William owned a watch in his youth that had to be wound with great care. Watches of the 1940s were expensive and highly prized. Hence, his frame of reference is that a watch is valuable, needs to be treated with care and is easily broken (Lim, 2010). The modern watch does not have to be wound, costs very little and is thus easily replaced. William's mental pattern is null and void with respect to watches but he may well retain it. Moreover, William has no constructed pattern to match modern mobile phones – the phones of his youth, which form his frame of reference, were not mobile, had a large dial, and only made and received calls. The modern phone is essentially a small computer, with a hierarchical menu and multiple functions. William's wisdom-filled brain simply cannot match his existing mental model of a phone to the modern mobile phone so he probably tries to match it to models of more sophisticated instruments from his youth, perhaps a gramophone, or an old-fashioned camera. Such items were easily broken and expensive to repair, so if he uses this mental model he is going to be afraid of breaking his mobile phone by doing the wrong thing. This fear of breaking things has been observed in other studies with the elderly (Van Veldhoven, Vasrenburg, & Keyson, 2008) and might be a real concern. They might also apply other patterns, which are likely to be equally unsuitable. William is confronted with this new technology: perhaps his children gave him a mobile phone, or he perceives the need to summon assistance in an emergency. Having acknowledged the need for the phone, he is faced with having to learn how to understand and use this new device, with the fear of breaking it always at the back of his mind deterring adoption. Furthermore, since his brain is not specialized to do this, as the young brain is, he learns more slowly (Glass, 1996).

[2] A Google search for the term "stupid old people" on 2 September 2014 delivered 1 490 000 results.

Yet Heinz et al. noted that "… *older adults were willing and eager to adopt new technologies when usefulness and usability outweighed feelings of inadequacy*" (Heinz, et al., 2013: 42) and indicated that future technology developers should be aware of the older users' attitude towards the uptake of new technology. This ties in well with (Young, 2013) who reports that this generation (older than 70) valued the use of new technology that allowed them to engage in social and leisure activities. Mitzner et al. also reports that older adults were positive towards technology, which contrasts with the widely-held idea that older users are "technophobes" (Mitzner, et al., 2010).

In summary, older people want to learn about technology, can learn, and are not recalcitrant technophobes, contrary to what some people believe. However, they will resist learning if the process makes them feel stupid (Hough & Kobylanski, 2009).

Inter-generational Understanding

Humans tend to classify people into categories and then attribute particular judgments to out-group members (Cuddy & Fiske, 2002). They tend to cling to their preconceptions, despite evidence to the contrary (Nickerson, 1998). Senior technology users are often negatively stereotyped by the younger generation.

Stereotyping is particularly harmful when it influences interface designers. Without intervention they might well design for themselves (Lim, 2010), or design based on their uninformed perceptions of an out-group. The obvious intervention is to find a way to make designers more aware of the needs of out-groups (Newell & Gregor, 2000). Stereotyping, especially with negative connotations, can be counteracted when there is meaningful interaction with individuals of the out-group (Caspi, 1984) (Erber, Etheart, & Szuchman, 1992) . Page et al. argues that unfortunate perceptions about older people can indeed be exacerbated by limited contact between generations (Page, Olivas, Driver, & Driver, 1981).

Hence the proposed study, to explore these perceptions, is a meaningful endeavour to facilitate this very beneficial interaction between the generations and hopefully foster greater understanding. Other studies that encouraged inter-generational interaction have been shown to improve attitudes towards the elderly (Couper, Sheehan, & Thomas, 1991).

Study Design

The purpose of this study was to confront students with actual older end-users of a common technology, the mobile phone. A contrived lab or classroom-based facsimile exercise cannot come close to delivering the same learning experience. The outcome, it was hoped, would be more realism and sensitivity on the student's side; a better understanding of user groups completely unlike themselves.

Two research questions were posed with respect to the snapshots taken each year:

> **RQ1**: Did the perceptions, feelings and mobile phone usage of the older participants change over the three-year period?

RQ2: Did the students' perceptions about older people change over the three-year period because of this exercise?

A fictitious company was supposedly keen to determine the mobile interface requirements of the over-65 age group in South Africa in order to develop an innovative interface for older mobile phone users. Students interviewed members of this population segment to explore their mobile phone usage and their feelings about the phone. They were asked to offer to teach their participant an application or function they were keen to learn about on their own phone.

This study was conducted at the University of the Western Cape, South Africa over a period of three years. Self-selected student teams (of up to five members) were instructed to acquaint themselves with the literature that would provide them with background knowledge about mobile phone usage by older users. They had to refer to this research in their team reports and include a list of the references they had consulted. Each team member interviewed two older mobile users in their local community with a predesigned questionnaire, essentially a convenience sampling. Some could only find one to interview. This questionnaire collected the demographics of the participants and their experience and usage of mobile phones but preserved their anonymity by not including any personal information. To adhere to ethical research practice, students were instructed to obtain permission from their participants by asking them to complete a consent form prior to the interview, which made participants aware of their rights to withdraw at any time.

Student teams were required to write a team report for the fictitious company, making recommendations based on the open-ended questions and the data they collected using a pre-designed questionnaire. Finally, the teams were interviewed as a focus group to gain their impressions of their participants' capabilities and their own reactions and perceptions of this demographic and their ability to learn a new function.

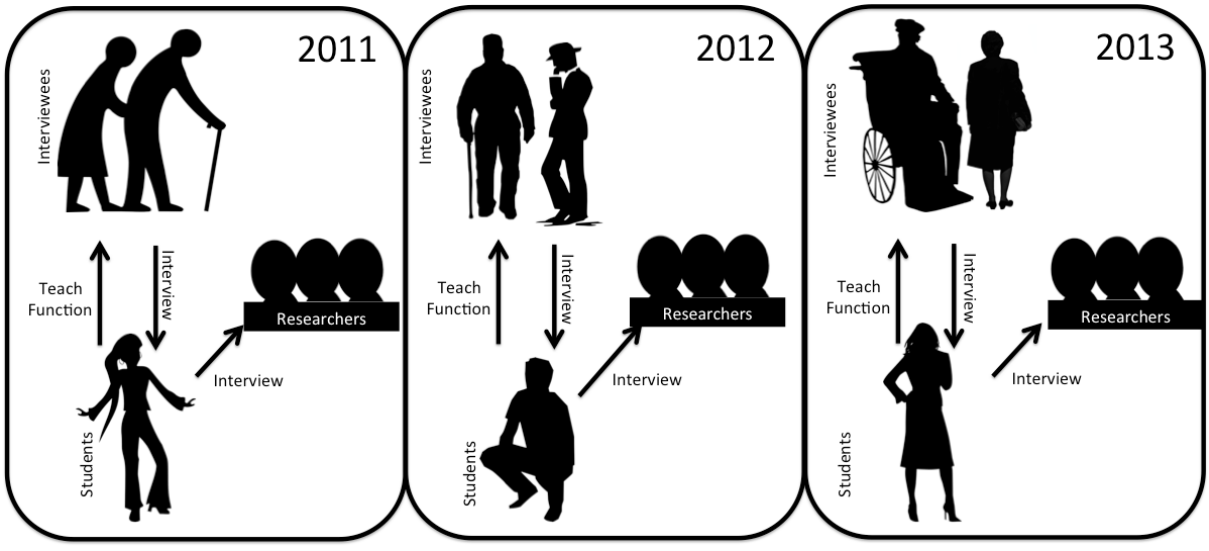

Figure 1: Three Years of Data Collection

Three years' worth of data was collected as follows (see Figure 1):

(1) How mobile phone usage by older mobile phone users changed over the three-year period (2011 – 2013) of the study. Quantitative data was analyzed using the Statistical package SAS®.

(2) A list of functions demonstrated to the older users was analyzed to determine if there was a change over this three-year period.

(3) Student reports and focus group discussions were evaluated to gauge students' perceptions of the "abilities" of the older user. Qualitative data (focus groups and student reports) was analyzed and compared to determine trends over this time period using a qualitative content analysis tool called QCA (Qualitative Content Analyser) (Bytheway, 2013).

Results

Demographics

A total of 239 participants (63 in 2011, 99 in 2012 and 77 in 2013) and 120 student researchers were involved in the interaction over the three year period. Most students (94%) were aged between 20 and 29 years. The majority of the participants (62%) were aged between 65 and 69 years; 17% were aged between 70 and 74 years; and 21% were older than 75 years. Slightly more females (56%) participated in the study over the three-year period. In the following section, the three years' data were compared using Chi-square (X^2) tests.

In 2013, more (49%) of the participants were skilled (had formal training) compared to 37% in 2012 and 33% in 2011. In both 2011 and 2012, about 40% of the participants were unskilled whereas only 35% were unskilled in the 2013 survey. In 2011, only 3% of the participants were unemployed compared to the 12% in 2012 and 11% in 2013. Over the years of the study, the participants that were retired ranged from 11% to 14%. Although these occupation percentages varied over the three years no significant differences were observed ($X^2 = 7.3$; $p = 0.30$).

Most participants lived in a city (63%) and the rest in small towns (26%) and 11% in rural areas. This was very similar in all years ($X^2 = 3.2$; $p = 0.52$).

It is interesting to note that most of the participants over the three years were Afrikaans speaking (36%), followed by Xhosa (29%), English (20%) and 15% spoke Sotho, Tsonga, Zulu, Sepedi, Venda, Ndebele, Tswana, French and Siswati. There was a significant language distribution change over the years with significantly more English speakers in 2013 ($X^2 = 35.4$, $p = 0.04$).

Over the years, 44% indicated that they were proficient in reading English and 40% could read English reasonably well, whereas 16% lacked English reading skills ($X^2 = 4.0$, $p = 0.41$). Forty percent of the participants indicated that they could write in English; 39% could write English reasonably well and 21% were not sure about their ability to write in English ($X^2 = 3.0$, $p = 0.56$).

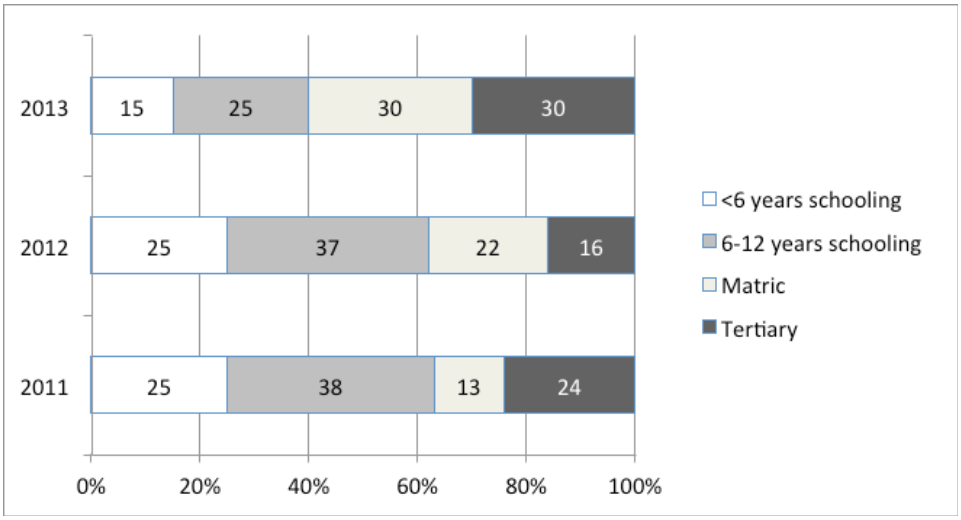

Figure 2: Highest qualification of the participants

The participant qualifications did not differ significantly over this period ($X^2 = 14.1$; $p = 0.08$) (see Figure 2).

The majority of the participants (70%) owned their mobile phones for more than 3 years ($X^2 = 0.3$, $p = 0.99$) in all the years of the study. These phones were acquired in a similar way in all three years by purchasing it (49%), receiving it as gift (44%) or being part of a contract (6%) ($X^2 = 7.9$, $p = 0.25$).

Phone Usage by Participants

Approximately two-thirds of the participants used their phones more than once per day, about 25% used it once a day and 10% less than once weekly.

Most keep their phones near them (80%) and more than 80% charge their phones at home using electricity. Only 13% used a battery to charge their phones.

Significant Differences over the years

From Table 1 it is evident that some mobile phone features were used more frequently over the time period were used (significantly) more frequently over the time period: phone calls; typing of a short message service (SMS),using abbreviations when typing a message SMS; the alarm clock feature and the use of the phone's camera. When comparing the three years there was no significant difference in the use of: multimedia messaging services (MMS), the Internet, Facebook, banking, the watch feature, calendar or the setting of reminders, listening to music on the mobile phone or using the torch or calculator.

Table 1: Participant Feature Usage over the Years

Usage	**2011**	**2012**	**2013**	**X^2 value, Significance**
Phone calls increased over the years	68%	83%	83%	$X^2 = 9.77$, $p = 0.0444$*
SMS use increased	27%	39%	49%	$X^2 = 23.23$, $p = 0.0001$**

Camera Not Used	75%	66%	51%	$X^2 = 10.67$, p = 0.0306*
Alarm Clock	32%	46%	51%	$X^2 = 9.66$, p = 0.0467*
Abbreviations used for SMS's	13%	21%	32%	$X^2 = 6.73$, p = 0.0346*
MMS	3%	10%	3%	$X^2 = 6.30$, p = 0.178
Calendar	17%	24%	20%	$X^2 = 7.86$, p = 0.0967
Internet Search	2%	3%	1%	$X^2 = 4.94$, p = 0.293
Facebook	3%	8%	1%	$X^2 = 5.88$, p = 0.2087
Banking	5%	12%	7%	$X^2 = 3.38$, p = 0.4962
Watch	69%	59%	56%	$X^2 = 4.28$, p = 0.3697
Reminders	11%	19%	17%	$X^2 = 5.39$, p = 0.2494
Music	8%	9%	10%	$X^2 = 3.3$, p = 0.5085
Torch	8%	12%	13%	$X^2 = 4.05$, p = 0.3995
Calculator	3%	11%	14%	$X^2 = 7.91$, p = 0.0948

*p<0.05; ** p<0.01

Table 2: Participants Feelings about their Phones over the years

Perceptions	**2011**	**2012**	**2013**	**X^2 value, Significance**
Confusing	40%	52%	61%	$X^2 = 13.17$, p = 0.0105*
Essential	74%	90%	87%	$X^2 = 16.24$, p = 0.0027**
Value for Money	90%	71%	73%	$X^2 = 9.66$, p = 0.0465*
Easy to use	79%	71%	79%	$X^2 = 10.57$, p = 0.0319*
Liking	95%	96%	88%	$X^2 = 13$, p = 0.0113*
Enjoyable	68%	65%	64%	$X^2 = 3.75$, p = 0.4414
Frustrating	25%	26%	27%	$X^2 = 0.33$, p = 0.9879
Appealing	48%	58%	58%	$X^2 = 2.28$, p = 0.6852
Overwhelming	29%	32%	29%	$X^2 = 4.98$, p = 0.2891
Useful	87%	90%	96%	$X^2 = 4.51$, p = 0.341
Time Consuming	30%	34%	29%	$X^2 = 5.83$, p = 0.2119
Friendly	71%	69%	77%	$X^2 = 2.33$, p = 0.6756

*p<0.05; ** p<0.01

From Table 2 it can be seen that mobile phone perceptions varied from year to year, but not always in a linear trend. Mobile phones seem to have been more confusing in 2013 (perhaps due to more features on more modern phones) than in 2011. A decrease in the mobile phone's "value for money" was also seen from 2011 to 2012 and 2013. Mobile phone frustration levels, although not too high, were very similar in all the study years.

Functions or Applications Taught

Differences in functions or applications that participants asked the students to teach them are shown in Figure 3. For example, fewer people asked to be taught how to SMS in 2013 as compared to 2011. This probably means that they already knew how to do it, especially since significantly more participants reported using the SMS function (see Table 1 above). On the hand, MMS, Phone book and Google search seemed to have increased in popularity in terms of requests to be taught how to use it. In 2011, no one asked to be shown how to use the camera but this changed in 2012, perhaps indicating that many of participants now owned phones with this capability; however, these requests decreased in 2013, probably because they now generally knew how to do this. The same trend manifests for requests about the function "phone settings" and how to set the alarm.

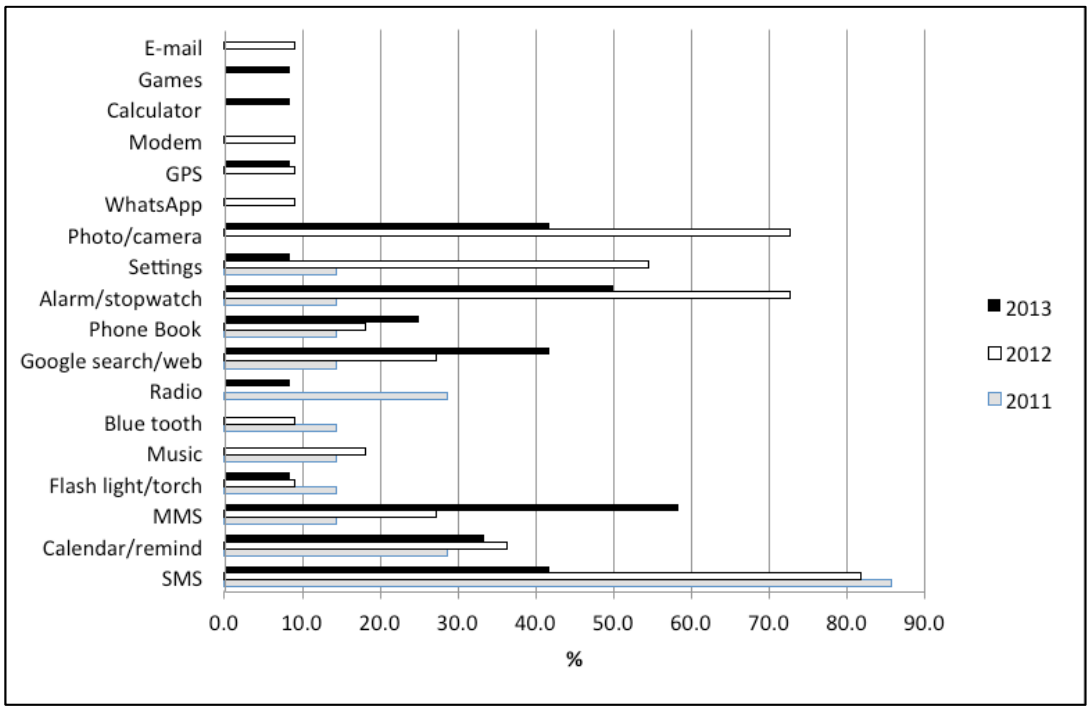

Figure 3: Features Taught to Participants

Student Perceptions

Focus group interviews, as well as student reports, were used to:

- determine what students learnt about the design limitations of mobile phones for the older users, and
- to gauge student perceptions about the abilities of the older mobile phone users.

Student team reports and summarized interviews were analyzed using the QCA tool. The tool required the researchers to identify phrases that depicted perceptions as well as suggestions for design changes to the mobile phone. The tool then quantified these phrases. The results are shown in Figure 4 and Figure 5.

In order to compare the QCA results of the three years, the frequencies were weighted as the number of teams in each cohort differed.

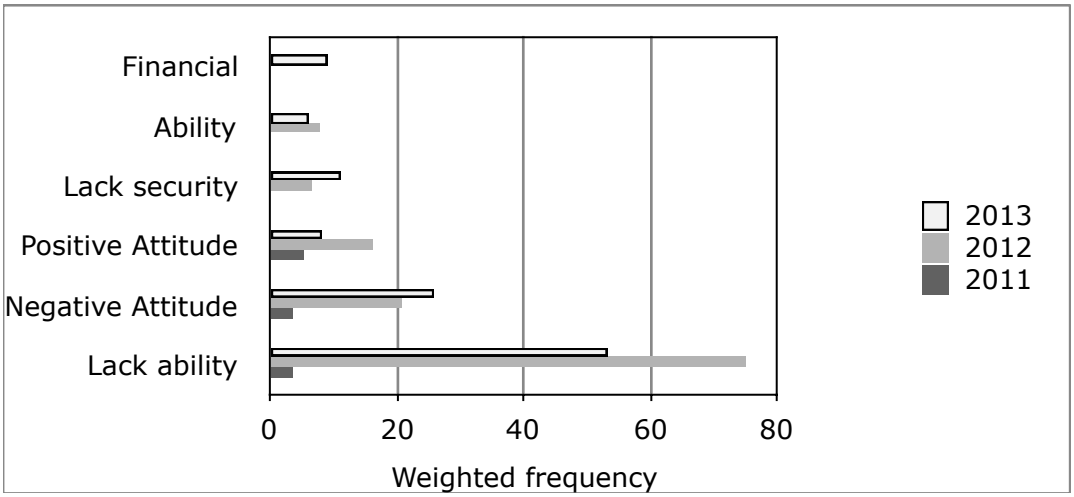

Figure 4: Students' perceptions of the older mobile phone users' abilities

It seems as if many students believed the majority of their participants lack the ability to use their mobile phones effectively (see Figure 4):

> *"Took several times to demonstrate new function …", "… phone closer to their eyes so they could read properly …"; "Some are less literate which made teaching difficult …"; "…older people are slower…"; "…struggle to understand concepts …";*

and that they had a negative attitude towards mobile phones:

> *"Participants not interested in learning anything …"; "… did not feel the need to know how to use many of the applications …".*

However, some students felt that their participants were positive about the mobile phone technology and its usage:

> *"The elderly people were very cooporative and attentive when we tried to explain new things to them …"; "Participant was excited about sending photos via mms …";*

but felt insecure when using their mobile phones:

> *"Older people did not want to explore …"; "…scared it would break…".*

The financial implications of using the phone were often incorrectly interpreted:

> *"… participants scared that it would cost airtime to set something on the menu".*

Since, in future, the students will probably contribute to the design of mobile phones; their awareness of the importance of the aesthetics of the device emerged (see Figure 5):

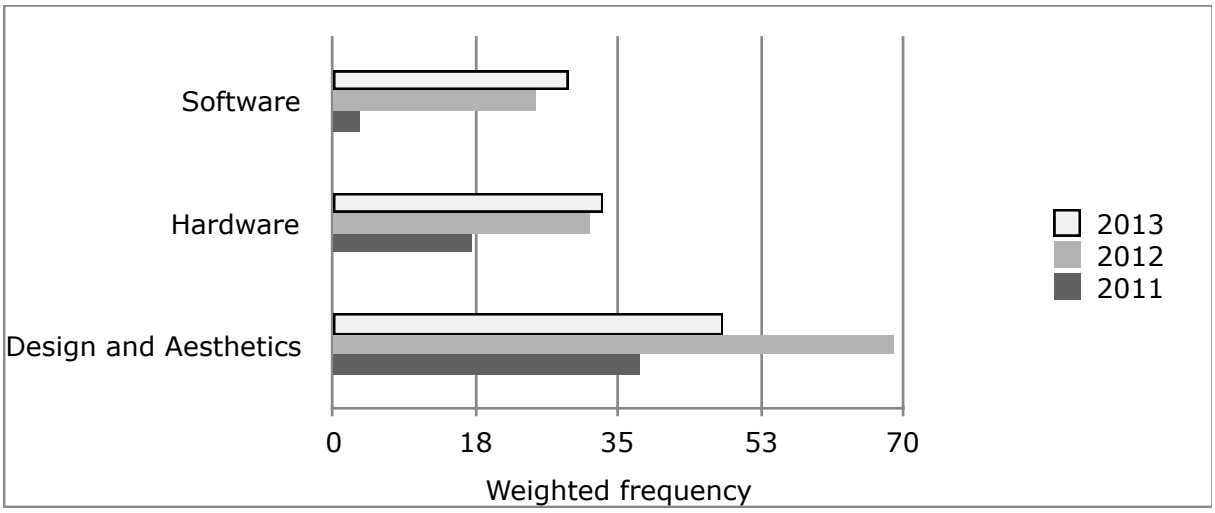

Figure 5: Perceived changes required to the mobile phone for easy usage by the older user

"Standardize the structure of the design of the phones targeted to the elderly so that it is easier to learn another phone …"; "A SOS button that will automatically connect to an emergency telephone number …";

and how the software and hardware should support it:

"… non-user-friendly menu and unclear arrangement…"; "… so the menus shouldn't be complicated and many …"; "Decrease the number of applications to only include useful applications likely to use by the elderly …"; "Important functions should be displayed in the menu …"; "Do not use touch screens. Want to feel the buttons …"; " … functions should be "hardwired"…"; " … button should be bigger and should click when pressed."; "… phone size should be fairly large …"; "… design should be very minimalistic and sleek".

Discussion

Fernández reported that mobile phones were peripheral to the older people's lives in their study (Fernandez, 2010). Conci, Pianesi and Zancanaro confirmed that mobile phone usage amongst the older population that they surveyed was mostly functionality driven (Conci, Pianesi, & Zancanaro, 2009). Our research findings contradict this – it was found that the older participants kept their phones with them, that they considered them essential and useful, and that they liked them. This difference is probably due to the superior infrastructure available to participants in the studies carried out by Conci et al. (Italy) and Fernandez (Europe). South Africa's older citizens often cannot rely on the presence of a landline phone and their mobile phone thus becomes integral to their lives.

It was interesting to see a definite trend in what the participants asked the students to teach them. If one considers this information together with the actual features they make use of, it becomes clear that they were mastering their phones, slowly but surely. They were becoming more proficient in the use of functions such as SMS, alarm and camera.

Nevertheless, the students still considered the participants slow, unable to master their phones, and generally did not acknowledge any noticeable cognitive capacity on their part. They expressed frustration and exasperation when demonstrating a mobile function to the elderly.

The analysis of student reports and interviews indicated that students, after demonstrating specific mobile phone functions to the elderly, accurately perceived the challenges that senior mobile phone users experience. Moreover, they could, and did, suggest interface improvements.

Conclusion

This study set out to answer two questions:

> **RQ1**: Did the perceptions, feelings and mobile phone usage of the older participants change over the three-year period?
>
> **RQ2**: Did the students' perceptions about older people change over the three-year period because of this exercise?

The answer to the first is in the affirmative. Each year's older participants were more clued up, used their phones more, used a wider range of features and felt more comfortable with their phones. The answer to the second question is in the negative. The students had the same attitude towards older mobile phone users every year. It might be that the gap between young and old remains too wide. The young learn so fast and keep pace with technology so easily that the older person's more sedate learning speed might well doom them always to be left far behind. It might be that this intergenerational gap, and the perceptions that color it, is merely a fact of 21st century life.

Yet there are glimmers of hope. Some of the students were changed by the experience. They spoke with greater empathy and understanding after having worked with their older participants. This means that it is important to continue to encourage and foster inter-generational contact, striving to build empathy and understanding in students. Without this, they will never be superb designers, and this is the real aim: to make them as good as they can be. Understanding, and being prepared to understand, all demographics, is an essential skill that needs to be nourished and nurtured.

In future work it will be considered whether there are any significant differences in the results for sub-populations—either in student perceptions or in the usage by elders. It will also be considered whether responses would differ depending on the age of the elders; their education; and whether they lived in cities or whether it is influenced by their occupation or social economic status.

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