Chapter X

Lay-User Characteristics Reflected by Their Interaction with a Digital Camera and a Blood Pressure Monitor

A. S. Cifter and H. Dong

X.1 Introduction

There is an increasing and evolving demand from the end-user market for the adaptation of products originally designed for professional-use to the use of lay people. Such products can be found in different market segments, for example hobby products, computer accessories and medical devices. "*Over the past few years there has been a huge increase in the number of medical devices being used by patients at home"*(Ludgate, 2003). This suggests that home use medical devices are an important market of this adaptation process. According to Margolin (1997), users have become a central theme of design discourse, though there is still a large gap in the knowledge of designers in this area. It is therefore paramount to understand lay users' characteristics so as to better adapt professional products for lay use (Cifter and Dong, 2009).

The main differences found between professional users and lay users are related to their **needs** and **expectations**. Regarding education and training there can be huge variance between professional users and lay users in terms of their skills in using the devices (Fries, 2006; Ram et al, 2005; Hogg et al, 2001). The contexts of use for lay people are often not clearly defined (Buurman, 1997; Clarkson et al, 2004; Gupta, 2007).

Lay users show significantly different user characteristics when compared with professional users. They lack confidence (Gupta, 2007) and are more likely to make errors (Lazar and Norcio, 1999; Edworthy et al, 2004). Errors can frustrate lay users who do not have any previous experience with the product (Lazar and Norcio 1999). When faced with problems, lay users are less able to overcome device limitations (Wiklund and Wilcox, 2005). Lay users are less likely to be aware of risks and follow the instructions provided (Edworthy, 2004).

On the other hand, in terms of capabilities of lay users, they vary significantly. Professional users can be expected to be healthy and more likely capable enough to

operate the devices (Wiklund and Wilcox, 2005). However lay users are highly variable and may be suffering from age or disability related physical, perceptual or cognitive problems (Wiklund and Wilcox, 2005; Gupta, 2007; Kaye and Crowley, 2000).

X.2 The Study

This study is focussed on lay-users in terms of their characteristics when interacting with products. It aimed to consolidate the existing theories with experimental data and identify any additional characteristics of lay users that were not covered by the literature. Since lay users are very diverse, the study also aimed to understand different lay user groups in greater detail.

X.2.1 Methodology

Lay people are classified according to the population pyramid model (Benktzon, 1993), i.e. able-bodied people (e.g. fully-able young people); less able people (e.g. older people suffering minor capability losses) and severely disabled people (e.g. people with permanent disabilities). The study aims to involve three groups of lay people:

- 10 able-bodied young people
- 10 healthy older people (65+)
- 10 disabled people

Since the study with disabled people is still ongoing, this paper will only report the results based on the two studies with 10 young people and 10 older people.

The study was conducted as product interaction trials which involved the completion of given tasks by the volunteer participants through interacting with two selected set of digital devices: A digital camera (Sony DSC-S730) and a digital automatic blood pressure monitor (Omron R7). These two products were selected based on their popularity and the fact that they both target lay people.

The study is largely descriptive, so observation was used as a primary method (Robson, 2002). Specifically, the video recording technique was used to capture user behaviours during their interaction with the products. Video recording methods also gave the opportunity to capture facial expressions which reflected the emotions and feelings of the participants during the study.

Questionnaires were used as an assistive method to the product interaction trials which enabled the comparison between the participants' comments, feelings and thoughts.

A pilot study was conducted with five people using convenience sampling. For the main study, quota sampling (Czaja and Blair, 2005) was used. Whenever it proved difficult in finding enough volunteering participants, snowball sampling (Robson, 2002) or convenience sampling was utilised.

The study has been approved by the ethics committee of the School of Engineering and Design, Brunel University. An information sheet and a consent form were disseminated to the participants before their participation. The participants were told that they were free to withdraw from the study at anytime

without giving any reason. The 10 younger people were recruited at Brunel University and the 10 older people through Age Concern Hillingdon.

X.2.2 Product Interaction Trials

The product interaction trails were conducted in a quiet room with one participant each time. The typical setting is shown in Figure X.1.

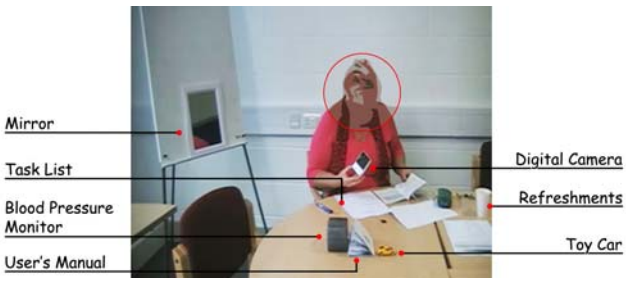

Figure X.1. The typical setting of the product interaction trials

The participants were invited to fill in a general questionnaire before they started the trial. This questionnaire asked about their age range, gender, education level and contact details. Then they were given a task list and asked to complete the tasks by using provided devices. There were seven tasks in total; the first three related to the Blood Pressure Monitor; and the rest related to the digital camera. These tasks were designed to capture data which are likely to reflect the user characteristics by earlier literature review.

Most of the usage problems were observed specifically during the second and the seventh tasks. These tasks are shown on table X.1.

Table X.1. The task list

Blood Pressure Monitor	
Task 2:	**Measure your blood pressure and write down the score.** *(attach the device to your wrist in the correct position as specified in the instruction manual, then switch the device on. The participants were supposed to use their elbow as a fulcrum and take the device to their heart height till hearing the beeping sound, indicating the correct height has been reached and a measurement has started. During the measurement they were expected to sustain their position until the device deflates. Then they were asked to write their scores down)*
Digital Camera	
Task 7:	**Erase the unwanted pictures and switch off the device.** *(the participants were asked to leave two pictures in the camera: one from Task 5 and the other from Task 6). If they had taken more than one picture on any task, they were asked to select the best one and erase the others.)*

Once the participants had finished the tasks, they were given another questionnaire which consisted of 19 questions in three groups:

- Their experience of interacting with the blood pressure monitor
- Their experience of interacting with the digital camera
- General preferences regarding the use of everyday products.

The participants were also encouraged to give any verbal feedback about their experience (e.g. thoughts, feelings about the tasks/products, and their expectations).

X.3 Results

This section reports the results of the finished studies with the 10 younger participants and 10 older participants whose profiles are shown in Table X.2

Table X.2. Profiles of the older and the younger participants

	Older				Younger			
Gender	Female	**8**	Male	**2**	Female	**4**	Male	**6**
Age	**65 and Over**				**Between 18-64**			
Disability	Impaired vision and or/hearing, arthritis, dexterity problems, diabetes, heart problems				-			

X.3.1 Typical Problems of Interaction

The interaction problems observed in Task 2 (blood pressure monitor) and Task 7 (digital camera) were explained below.

Task 2	Measure blood pressure and write down the score.
Younger participants	6 out of 10 failed (failure rate 60%)
Older participants	8 out of 10 failed (failure rate 80%)

The position of the device on wrist was not correct: This was the most common problem. A total of 15 out of the 20 participants (8 older and 7 younger) experienced this problem. 5 older and 4 younger participants made this mistake but then corrected their position. In total 6 participants (3 older and 3 younger) failed this task because they did not recognise their mistake and eventually misused the device.

Randomly Pressing Buttons: 6 older and 2 younger participants adopted a trial and error approach and started to press buttons randomly. However this situation did not have affect on the final result, hence it was accepted as a mistake.

Difficulty in Understanding the Instruction Manual: Surprisingly the explanations in the instruction manual confused many older participants more than helped them. For instance many participants pressed the arrow buttons on the device unnecessarily because in the instruction manual it writes "When the (◄►) will reach the (♡) sign you will hear a beeping sound indicating that your blood pressure monitor is at the correct height (heart height)." Essentially it means that

the arrow sign (◄►) on the screen will move towards the heart sign (♡) when the device has reached the heart level. Unfortunately the participants related the (◄►) symbol to the physical arrow buttons on the device. In total 6 older and 3 younger participants experienced confusion.

Difficulty in Understanding the Terminology Used in the Instruction Manual: The blood pressure monitor only starts working when it has reached the heart height. The manual says "adjust the height of your wrist by using your elbow as a fulcrum". However it was observed that 6 older participants could not understand what was meant by "fulcrum". This difficulty could not been observed with younger participants because they were left alone in the testing room.

Task 7	Erase the unwanted pictures and switch off the camera.
Younger participants	1 out of 10 failed (failure rate 10%)
Older participants	9 out of 10 failed (failure rate 90%)

This task was the most unsuccessful task for the older participants which resulted in withdrawals. The main problem observed was the **confusion of the variety of the buttons**. 6 out of the 10 older participants adopted a trial and error approach by **randomly pressing buttons** and 3 of them accidentally changed the default settings of the device due to multiple functions of buttons. Some of the participants assumed and claimed that they had erased the unwanted pictures without knowing that the pictures were still stored in the camera.

X.4 Discussion

The majority of the participants experienced difficulty in understanding the visual and/or text based explanations given in the instruction manual. Particularly for older participants, the explanations led to confusion and resulted in more mistakes.

It was observed that the previous experience has a positive impact on the digital camera tasks especially for younger participants. However prior experience misled the participants when they performed the blood pressure monitor tasks. This suggests that prior experience could have a negative impact in interaction with products.

Younger participants performed the tasks better than the older participants. The main difference was found to be their motivation.

Older people tend to blame themselves when they encounter difficulties. They are less familiar with the concepts, visual language and the interface metaphors of digital devices (Eisma et al, 2004). This was observed during the digital camera trial where, for instance, most of the older participants experienced difficulty in finding the playback button and using multiple functional buttons.

X.5 Conclusions

The younger and the older participants demonstrated different characteristics during the study. The reasons for the failure of the older and the younger participants differ significantly. Some of the characteristics found from literature were more appropriate for the younger participants whereas the others were more

relevant to older participants. Therefore it was found to be useful to investigate lay-user characteristics within the sub-groups of lay users, such as younger, older and disabled people to provide more information for designers.

The majority of the participants found the instruction manuals complicated, confusing or not suitable for them in terms of their capabilities and did not want to use them after sometime. This suggests that a design-out-of-instructions approach may be adopted, or the instructions could be made more interactive and self-explanatory.

X.6 References

Benktzon M (1993) Designing for Our Future Selves: the Swedish Experience. Applied Ergonomics, V.24, No.1, P.19-27

Buurman, R (1997) User-centred design of smart products. Ergonomics 40: 1159-1169

Cifter A S, Dong H (2009) User Characteristics: Professional vs. Lay Users, Include 2009 Proceedings, Helen Hemlyn Center, RCA.

Clarkson P J, Buckle P, Coleman R, Stubbs D, Ward J, Jarrett J, Lane R, Bound J (2004) Design for patient safety: a review of the effectiveness ofdesign in the UK health service. Journal of Engineering Design 15: 123-140

Czaja R, Blair J (2005) Designing Surveys: A Guide to Decisions and Procedures. Sage Publications, Pine Forge Press, London

Edworthy, J, Hellier, E, Morley, N, Grey, C, Aldrich, K, Lee, A (2004) Linguistic and Location Effects in Compliance with Pesticide Warning Labels for Amateur an Professional Users. Human Factors 46: 11-31

Eisma R, Dickinson A, Goodman J, Syme A, Tiwari L, Newell A F (2004). Early User Involvement in the Development of Information Technology-Related Products for Older People. Universal Access in the Information Society 3: 131-140

Fries R (2006) Reliable Design of Medical Devices. Tylor & Francis. CRC Press.

Gupta S (2007) Design and Delivery of Medical Devices for Home-Use: Drivers and Challenges. Cambridge, Department of Engineering.

Hogg, C, Williamson, C (2001) Whose interests do lay people represent? Towards an understanding of the role of lay people as members of committees. Health Expectations 4: 2-9

Kaye R, Crowley J (2000) Medical Device Use-Safety: Incorporating Human Factors Engineering into Risk Management. FDA

Lazar J K, Norcio A F (1999) To Err or Not To Err, That is The Question: Novice User Perception of Errors While Surfing The Web. IRMA International Conference Proceedings. IGI Publishing

Ludgate S (2003) Why the MHRA Needs Your Help, The Pharmaceutical Journal 271: 7278, P.780

Margolin V (1997) Getting know the user. Design Studies 18: 227-236

Ram B M, Browne N, Grocott P, Weir H (2005) Methods To Capture User Perspectives in the Medical Device Technology Life Cycle:A Review of the Literature In Health Care, Social Science, and Engineering & Ergonomics. Multidisciplinary Assessment of Technology Centre for Health.

Robson C (2002) Real World Research: A Resource for Social Scientists and Practitioner-Researchers, Blackwell Publishing

Wiklund M, and Wilcox S (2005) Designing Usability into Medical Products. CRC Press