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OLDER PEOPLE AS EQUAL PARTNERS IN THE CREATIVE DESIGN OF DIGITAL DEVICES

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This thesis is submitted for the degree of Doctor
of Philosophy in Human-Computer Interaction

City University London
School of Informatics

Centre for Human Computer Interaction Design

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Figure 1: Flower from one of the older participants.

Declaration

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ABSTRACT

This thesis describes research which explores the importance and feasibility of involving older people as equal partners in the creative design of digital devices for an ageing population. In exploring this topic, I have carried out two preliminary studies, a pilot study and a major empirical study.

Firstly, I invited three groups of people, including very old people, active older people and postgraduate students, to evaluate a mock-up model of an interactive device intended for older people that was designed using a standard design process. The results of this study suggested that products without an adequate contribution from older people would not always meet their needs.

Secondly, I carried out observations of very old people, active older people, and young designers to identify factors that influence the way in which both older people and young designers can be involved in the creative design process. These factors included experiences with technology, processes and approaches currently applied with older people and designers, factors that stimulate or inhibit creativity, and practical constraints such as health issues. The results of these observations fed into the design of a pilot study, where I tested the content of a creative design process and a procedure for analysing data for the main empirical study.

The main study involved three creative workshops where the same creative methods were employed with different sets of people: young designers, mixed groups (with older people and designers) and older people only. The results show that older people are able to participate in a creative design process; however, certain practical constraints have to be taken into account. Also, older people perform better when they work together with designers. Finally, the mixed groups with older people, who have relevant life experiences, and designers, who are familiar with the newest technology, may be more suitable for designing appropriate products for the older population.

Keywords: creativity, older people, user centred design, evaluations, observations, creative design process.

GLOSSARY

UCD	User Centred Design
HCS	Human Centred System
HCI	Human Computer Interaction
HCID	Human Computer Interaction Design
HSS	Hackney Silver Surfers
VOP	Very Old People
AOP	Active Older People
PGS	Postgraduate Students
IT	Information Technology
RQ	Research Question
H	Hypothesis

1 INTRODUCTION

In this chapter the thesis rationale will be discussed. Firstly, two features of the PhD research will be highlighted: a.) the importance of involving older people in the design process and, b.) creativity, creative approach and creative people. The outline of the PhD research and research questions, with objectives and hypothesis, will then be introduced. The chapter finishes with contributions to the field.

1.1 THESIS RATIONALE

The aim of this PhD research is to demonstrate the importance of involving older people as equal partners in a creative user-centred design process in order to design better digital devices for this population.

1.1.1 THE IMPORTANCE OF INVOLVING THE OLDER POPULATION IN THE DESIGN PROCESS

Older people have to cope in their daily lives with the various ageing and technological challenges that life brings. Below are some practical examples, which illustrate these challenges:

"I have a lot of trouble with your remote controls" the Queen told the Sony boss over lunch: "Too many arrows on them" (Bushell, 2007: 10).

"As my grandparents have more trouble walking, I wanted to get simple cordless phones to let them keep a phone nearby. But I can't find a cordless phone that fits the bill. Cordless phones now have too many features: the buttons are too small, the displays are too small to read, and they don't easily fit into the charger. Go to the store and try to find a simple cordless phone: you can't. My grandparents couldn't hold these small phones or press the buttons" (Lazar, 2009: 34).

"I recently watched an elderly lady struggle to extricate herself from the front seat of a car. "Now there is a huge opportunity," I said to myself, "we live in an aging society, yet we still design for the young and able. Why not address this huge, important market?" (Norman, 2009: 1).

Healy (2003: 4) lists several reasons why older people do not use mobile phones, such as i.) lack of good design; ii.) older people's needs are rarely taken into account during the design process; and iii.) the majority of mobile phones are designed for a population aged between 11 and 40 years old, or designers' needs. These results lead to the exclusion of the older population from a user-friendly type of technology. The same author (2003: 4) reported that designers complained that older people were not adopting this technology or buying these products (see Figure 2).



Figure 2: Two examples of remote controls where the users were not involved in the design. Remote controls with too many buttons and commands (Getty Images, 2007) (left), and a cordless phone where it is difficult to identify numbers, because of the stylish design (Gadget review, 2009) (right).

There is clear evidence that the British population is increasingly ageing (Intel, 2006; Audit Commission, 2008a: 13). 34 per cent of the British population were aged 50+ in the year 2009, and last year 2.4 million were 80 years old or more (Audit Commission, 2008a). The number of people who are 50+ will increase by the year 2029 to 40 per cent, and 4.3 million will be 80+. Furthermore, O'Higgins (2008, cited in Audit Commission, 2008b) reports that most people 50+ are living in their own homes with only 3 per cent in residential homes.

Based on the forecast that in 10 years 25 per cent of the European population will be more than 65 years old, the European Commission (2008) decided to approve a strategy for developing digital technologies. This strategy aims to help older people to continue living independently. The program focused on developing digital products and services, such as *"smart devices for improving security at home, mobile solutions for vital sign monitoring and*

user-friendly interfaces for those with impaired vision or hearing” (European Commission, 2008). The Commission presented two examples of such devices: an alarm system that allowed older people to get support when they required it, and a domestic appliance remote control (TV, heating systems, microwave, and washing machine) for people with mobility and memory disabilities. However, they hoped that many more innovative products would be developed.

The German government (Putting People First, 2008) went even further; in 2008 they introduced an initiative to promote universal and trans-generational design in order to produce new products and services for all generations. The main aim of the project was to connect various companies, professionals who work with older people and “consumers” to exchange ideas in order to design a better product appropriate for different populations.

In reality, interfaces and digital products are designed for a broad market and mostly used by younger people (Gregor et al., 2002: 781); therefore, not all products satisfy older peoples’ needs. Even products for the older population are designed by middle-aged designers who use the newest technology, but are not familiar with older people’s lifestyle, their way of thinking and expectations (Healy, 2003). This results in the development of inadequate products (see Figure 2), which do not take account of the physical or cognitive aspects of ageing and therefore older people show dissatisfaction and refuse to buy them (Healy, 2003).

In addition, older people’s influence on design is usually minor and their attractiveness as a target group for new technologies is surprisingly low (Healy, 2003: 5). Designers and marketing departments believe that older people are not creative (Sanders, 2001). Thus, older people are rarely involved in a standard product design process and only if they are in focus groups (Sanders, 2001) at the beginning of a design process or in usability tests at the end (Engdahl et al., 2009). Therefore, Healy (2003: 8) identified a need for developing new research techniques and methodologies in order to address this gap between older people and designers.

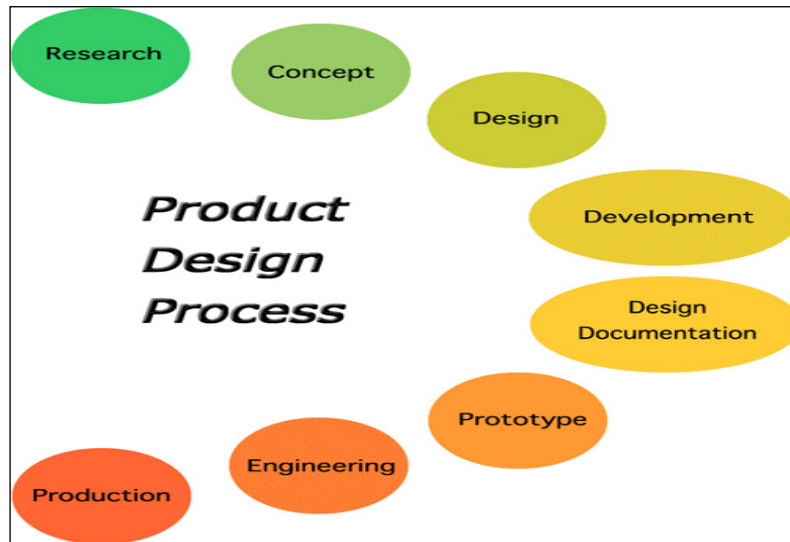


Figure 3: Standard product design process: an example of the standard product design process with all typical stages (Costello Design, 2002).

1.1.2 CREATIVITY, CREATIVE APPROACH AND CREATIVE PEOPLE

Cox (cited in Dyckhoff, 2008) states that creativity is becoming more and more important, especially in the innovative and competitive UK market, as well as globally (Design Council, 2006). Bichard (cited in Dyckhoff, 2008) states that *“design, creativity and innovation are essential if we are to meet the global challenges of sustainable development”*.

Best (2006: 112) argues that design is *“a rigorous, cyclical process of enquiry and creativity”*. Creativity can be understood as *“the act and the art of creating, is an approach, skill, characteristic and talent”* in how people approach a *“situation, problem or opportunity both in business and in life”* (Best, 2006: 112). The design process (see Figure 3) consists of different applied methods depending on the design project (Best, 2006). On other hand, the creative process is a sequence of acts that someone performs in order to find a creative solution to the problem (ibid). This means that everyone is capable to come up with creative solutions and as Bichard (2008, cited in Dyckhoff, 2008) and Sanders (2001) state, consuming is a creative act and therefore everyone can be creative.

People are important and demanding consumers, with everyday experiences, wishes and needs which could produce a very large creative potential (Sanders, 2001: 1). Since they are not using creativity as professionals their creativity more likely is hidden; therefore, it is necessary to stimulate this creativity with appropriate methods. However, Cohen (2008)

states that *“ordinary people’s creativity can be as powerful and enriching as those who influence all our futures by their creative efforts”*, and the creativity of older people is often shown in their coping with the everyday challenges and physical limitations that the ageing process brings, and in solving problems in their daily lives.

1.2 THE PHD OUTLINE STRUCTURE

The different technological challenges that older people have to face in their daily lives, the fact that older people are not involved in the creative process, that technologies are designed for the younger population, and older people’s low level of influence over the design of technology lead to the first preliminary study. The purpose of this study was to evaluate the future design concept of an interactive device for older people, in order to test how different groups of older people accepted a concept designed by a designer in a design process where the user is not involved, and where assessment is not an essential part of the process. Then, in the second preliminary study, two groups of older people and one group of designers were observed in order to get more information on how older people use technology, existing approaches and design processes, to investigate factors that stimulate or inhibit creativity and identify practical implications. After that, a creative design process and appropriate creative methods (such as Cultural Probes, Creative Cards, the ‘Magic box’ and others) were proposed and tested in the pilot study. The methods and approach to analysing the design process and final output are described in more detail in the methodology chapter. Finally, the same process and methods were applied in the main study with a group of designers, a group of older people and designers, and a group of older people. The results of the study are reviewed in the discussion and conclusion chapter.

The PhD thesis is comprised of two volumes. Volume 1 contains the PhD thesis and Volume 2 contains the appendices. Volume 1 is divided into the four sections: a.) introductory section with the literature review; b.) two preliminary studies; c.) the pilot and the main study, including methodology; and d.) conclusion, including an overall discussion of the whole work and references. The overall structure of the thesis is graphically presented in Figure 4, while Table 1 represents the main themes and relationships between the chapters. The contents of the chapters is as follows:

a.) The first section

Chapter 1: Introduction

The aim of this chapter is to introduce the problem of not involving older people in the design process when designing devices for this population, which results in inadequate design and low use of technology by the older population. Furthermore, this chapter establishes what had to be done to solve this problem by proposing the use of a creative design process and appropriate methods. After that, the content of the PhD thesis is introduced and contributions to the field are presented.

Chapter 2: Literature review

In this chapter the literature for understanding the field of the study is introduced. The chapter contains the following three parts: i.) the first part presents various definitions of creativity and the parameters important for measuring creativity in the design process and in the created product; ii.) the second part discusses older people in relation to creativity and technology, and different methods adopted to involve them in creative engagement; iii.) the third part examines older people in the creative design process.

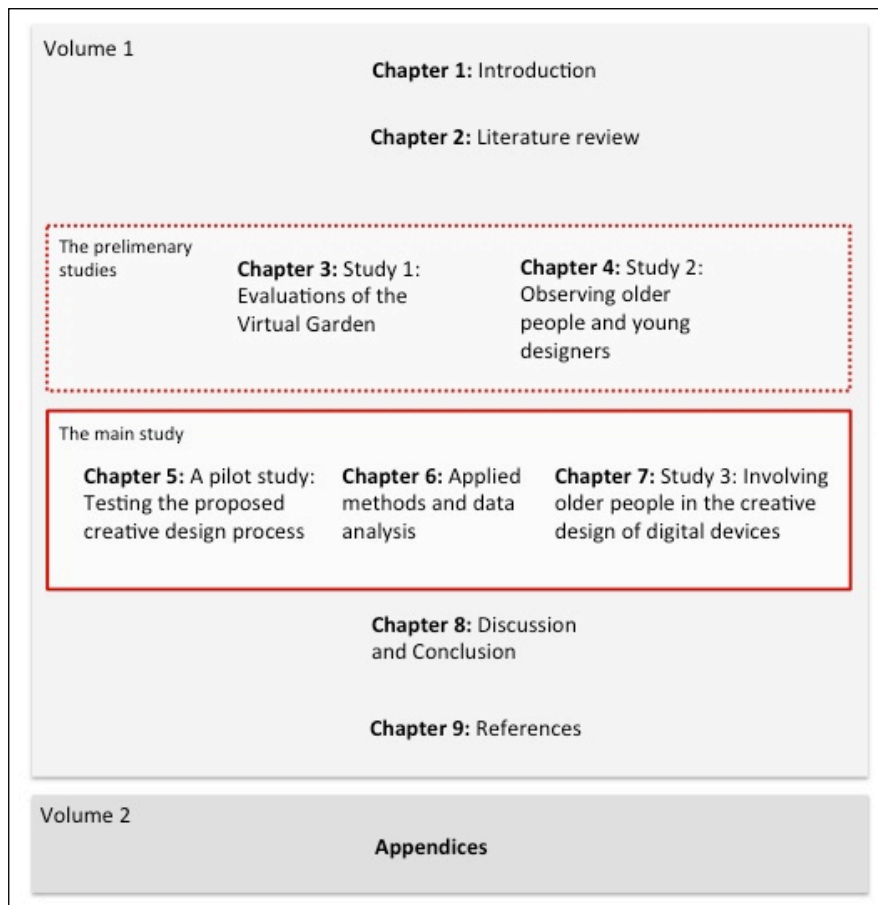


Figure 4: Structure of the PhD thesis: structure of the entire thesis and its division into eight chapters.

b.) The second section

Chapter 3: Study 1: Evaluation of the Virtual Garden

The first preliminary study evaluated a future interactive device (represented by a mock-up model) designed by a designer using a standard product design process (see Figure 3). The mock-up was tested by three sets of people: a group of very old people in their eighties, a group of active older people in their sixties and a further group of postgraduate students in their twenties. The results from the study indicated that a design process where older users were not involved was not the most appropriate for designing digital devices for the older population.

Chapter 4: Study 2: Observing older people and young designers

The aim of the second preliminary study was to understand older people and designers in order to propose appropriate methods for involving them in the creative design process. In

addition, the study aimed to investigate their experiences with technology, existing approaches to the design process, and factors that stimulate and inhibit creativity during the design process. Finally, practical conditions that have to be carefully considered if older people are to be involved in the design process were looked at. Therefore, three field studies were conducted in three different places: at entertainment meetings for older people in the Vintage Club, at a computer course for active older people in the Hackney Silver Surfers Centre, and in an Inclusive Design module at City University London, where the postgraduate students were observed. The observations indicated the possibility of involving the active older people and designers in working together. However, it became clear that the very old people needed (because of their health conditions) a more distinctive approach and it was therefore decided not to involve this group in the subsequent studies.

c.) The third section

Chapter 5: A pilot study: Testing the proposed creative design process

The plan for this study was to test the proposed content of the creative design process and the process of analysing data in the main study. In order to address those two aims the proposed creative design process was tested. The creative workshop was run with one researcher, one PhD student and one older person, and consisted of a four-stage creative process. For analysing data from the creative design process, Guilford's¹ (1959) four creative factors and Paulus's (1999) factors that inhibit and stimulate creativity were used. The creative output was assessed with a questionnaire.

Chapter 6: Methodology: Applied methods and data analysis

This chapter consists of two parts. In the first part all applied methods are reviewed, and in the second part a new approach to analysing video data is presented. In the first part all applied methods in the main study (Cultural Probes, creative workshops, Creative Cards, worksheets and the 'Magic Box') are revealed. Firstly, the original sources of the methods are examined, and how other authors adopted them, and finally the authors' version of the method is presented. In the second part, firstly measuring creativity during the creative process and analysing video data from other authors and lessons learned from the pilot study are presented. Then, definitions of parameters (flexibility and topics, flow and turns and factors that stimulate and inhibit creativity) that were measured during the design

¹ Guilford's four creative factors are: flexibility, fluency, originality and elaboration.

process are presented, followed by the authors' approach to analysing video data. The evaluation of the final output and conclusions are presented at the end of the chapter.

Chapter 7: Study 3: Involving older people in the creative design of digital devices

The main study attempts to investigate the importance and feasibility of involving older people as equal partners with designers in the creative design process. It also aims to examine the creative process and measure the novelty and appropriateness of the final output. In order to achieve this, three creative workshops were conducted involving groups of designers, of older people and designers together, and older people on their own. Each creative workshop consisted of two parts. First was the preparation part using the Cultural Probes method, and then the second creative workshop part, using the four stage-creative process designed by Wallas and Poincaré (Wallas, 1926). The outcome indicated that when designers and older people worked together they produced more complex ideas, because of their diverse backgrounds and different experiences. Furthermore, they adopted more and various stimuli, developed fewer factors that inhibited their creativity, and, according to the experts' opinions, designed more appropriate products for the older population than the other groups.

d.) The fourth section

Chapter 8: Discussion and Conclusion

This chapter brings together the entire study, aggregating research questions and the hypothesis. After that, theoretical and practical contributions are presented, with the limitations of the study. The chapter concludes with future work and lessons learned.

1.3 THESIS CONTRIBUTIONS

This PhD study will provide useful information for design and HCI researchers, academics and practitioners, and justifies the involvement of older users in the creative design process in order to design more appropriate products for this population. The study delivers the following contributions:

- New methods adapted in the creative design process are introduced (see chapter 6)
- A new approach to analysing rich video data is proposed (see chapter 6)
- New factors that stimulate and inhibit creativity are indicated (see chapter 7 and 8)

- The feasibility and desirability of bringing designers and older people together is proven (see chapter 8)
- Guidelines that can be taken forward and applied in practice by developers are presented (see chapter 8)

New methods applied in conducted studies are described in more detail in the methodology chapter and related terminology is presented in the literature review chapter. All conducted PhD studies were approved by the City University London Ethics Committee (see Appendix 3).

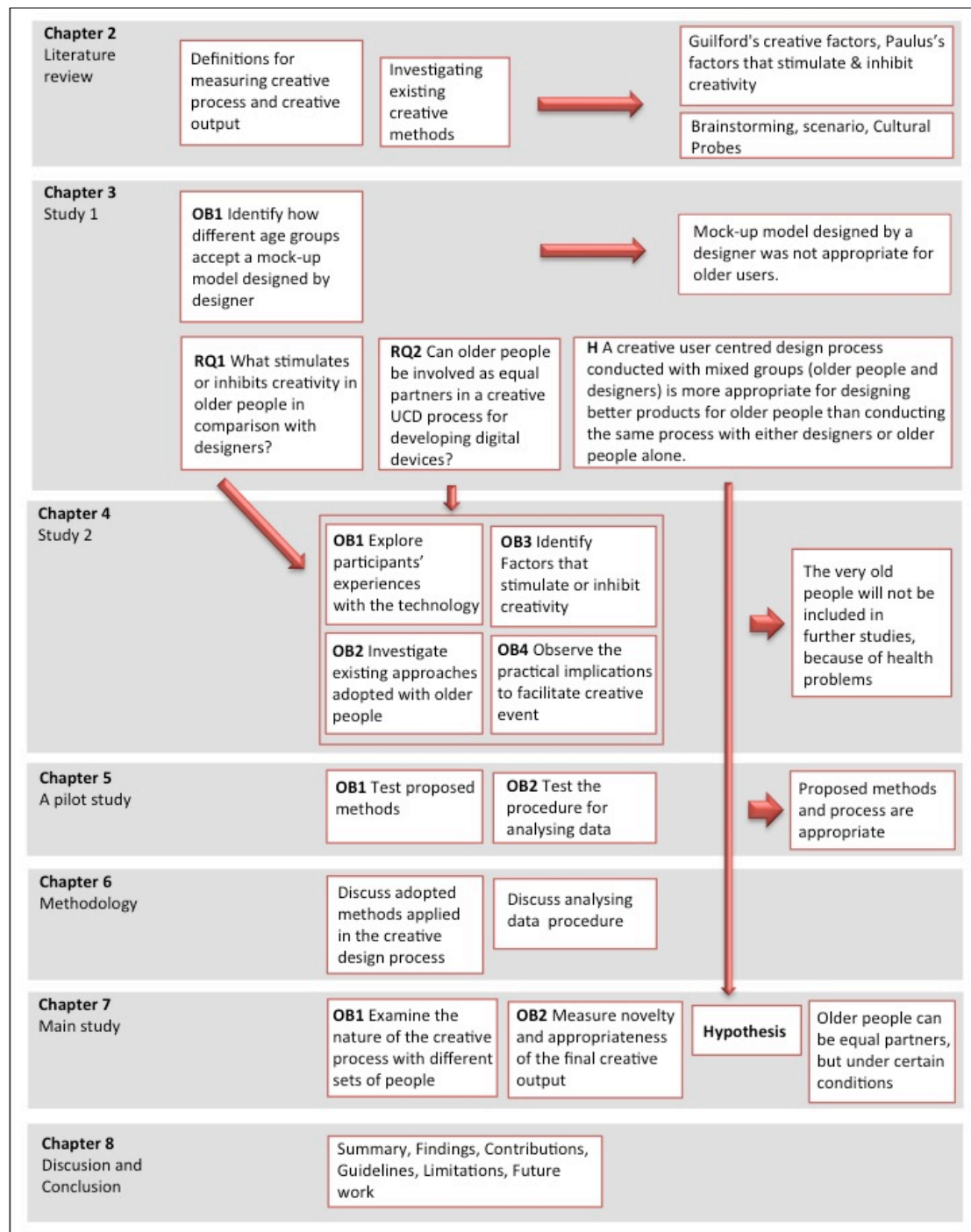


Table 1: The main aims of the thesis and relationships between chapters.

2 LITERATURE REVIEW

2.1 INTRODUCTION

This chapter aims to identify the appropriate definition of creativity applicable in the studies conducted, and to investigate existing approaches to measuring the creative process and output, phenomena that can be measured and factors that stimulate or block creativity. Furthermore, there was interest in the existing methods (such as traditional methods, participatory design, Cultural Probes, the co-design approach and so on) for involving older people in the design process, and their significance.

This chapter is divided into three main sections: i.) creativity, ii.) designing technology for older people, and iii.) involving older people in the creative design process. In the first section different approaches to defining creativity (4P² of creativity, novelty and appropriateness) will be discussed. Then, different parameters important for measuring creativity within the design process (fluency, flexibility, quality, elaboration) and the product created (novelty and appropriateness, situation novelty) will be examined. The second section will investigate who older people are, various HCI methods (the co-design approach, participatory design) and other studies where older people (using traditional approaches) were involved. Finally, involvement of older people in the creative design process will be investigated.

2.2 CREATIVITY

2.2.1 THE IMPORTANCE OF CREATIVITY

Creativity in human history has always been the key element in most revolutionary innovations. Therefore, we could say that creativity is a vital element in transformation, economic and social development, education, food production, health and ethical issues, and it can lead to more democratic systems and worldwide political stability (Cropley, 2001). Creativity has also been an essential element in the transition from agriculture to the industrial revolution, which was replaced by the information era (De Bono and Heller, 2008).

² 4P means 4P of Creativity, which are Person, Process, Press of the environment and Products (Lee et al., 2009) (see section 2.2.2.3).

In the 21st century creativity is becoming even more important as an economic component, especially since the economic market is becoming more demanding; as a result the only answer is to be more innovative and creative (Cox, 2006: 1). Only companies that will be able to apply diverse thinking in their design process in order to discover novel approaches to multifaceted problems, as well as introduce more environmentally-friendly production, will remain in the market (Cox, 2006: 1).

2.2.2 BASIC CONCEPT OF CREATIVITY

The understanding of creativity has changed during throughout history (see Figure 5). However, it is very likely that creativity will be linked to areas such as intellect, different thinking styles, motivation, cultural background, measuring creativity, who is involved in the creative process, factors that block creativity and so on. However, most researchers have proposed general concepts of creativity applicable across domains, disciplines and fields. The definition of creativity can be variously based on creative processes, the people involved in those processes, creative activity, performance and final output.

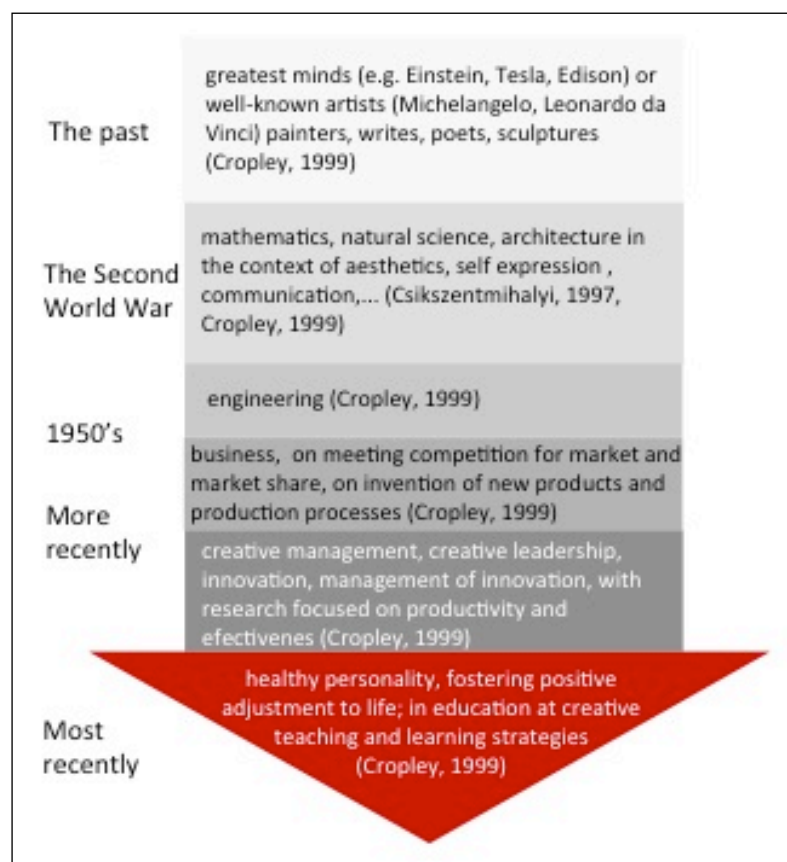


Figure 5: The development of the understanding of creativity from the past until more recent times (Cropley, 1999).

Creativity is a 'creative act' that occurs in someone's thoughts. The most-cited researchers Csikszentmihalyi (1996, cited in Johnson and Carruthers, 2006: 28) and Koestler (1964) had similar definitions of the creative act; Koestler (1964: 656) called it '*bisociation*'. Koestler (1964, cited in; Sanders, 2001; Warr and O'Neill, 2005b) discussed the '*bisociative process*' when someone brings together and combines an unrelated '*matrix of thoughts*' that produce a creative idea. According to Csikszentmihalyi (1996, cited in Johnson and Carruthers, 2006: 28; Bichard, 2008) creativity occurs when "*a person, using the symbols of a given domain such as music, engineering, business, or mathematics has a new idea or sees a new pattern, and is selected by the appropriate field for inclusion into the relevant domain*".

Numerous definitions of creativity exist, but there is no "*universal agreement on the definition of creativity*" (Getzels, 1975, cited in Feldhusen and Goh, 1995). Bailin (1994) states that creativity is connected with originality and therefore breaks from the usual; it can be manifested in a new and novel way of thinking that breaks with previously established norms. In general, creativity is a combination of things that we already know, but when we combine them in a new and unusual way (Johnson and Carruthers, 2006: 999) or do them differently (Cropley, 1999: 518) then we are creative. Cropley (2001: 5) describes creativity as "*finding new approaches to old problems*" and as a "*principle related to something new, different and unusual*" (1999: 516). If we want to state that something is creative then there needs to be a "*production of novelty, that is, departure from the facts, finding new ways, inventing answers and seeing unexpected solutions*" (Cropley, 1999: 516). Another way to discuss creativity could be using the 'Eight paradoxes of creativity' by Cropley (1999: 524), which present what creativity can be and what it is not:

1. *creativity involves difference from the everyday, but is found in everybody;*
2. *novelty, the single essential element in creativity, is necessary but not sufficient to define it;*
3. *creativity is not the same as intelligence, but it is also not completely different;*
4. *creative production requires deep knowledge, but freedom from its constraints;*
5. *creativity implies bringing something new into existence, but can be studied without reference to products;*
6. *creativity requires deviating from social norms, but doing this in a way that the society can tolerate;*

7. *creativity requires combining contradictory personality characteristics;*
8. *opposite kinds of motivation can lead to creativity”.*

Candy and Edmonds (1997, cited in Johnson and Carruthers, 2006: 999) suggest following a compromise definition of creativity, which is *“a set of activities that give rise to an outcome or product that is recognized to be innovative as judged by an external standard”*. In the next section significant aspects of creativity will be discussed, such as:

- divergent thinking, which is the basis of creative thinking
- everyday creativity or *“little c”* creativity
- 4P of creativity (person, process, press of the environment³ and product)
- individual and group creativity.

2.2.2.1 DIVERGENT THINKING

Guilford (1968; Runco, 1999; Cropley, 2001) was the first researcher to recognize and distinguish between *divergent* and *convergent thinking* and to present the most comprehensive model of divergent thinking. Convergent thinking delivers correct answers to given questions, usually focuses on recognizing what is familiar and preserving what is already known, and therefore it does not produce novelty (Cropley, 2001: 32). This thinking is highlighted in most academic examinations and IQ tests. Guilford (1950, cited in Cropley, 2001: 32) established divergent thinking as the basis of creativity. Divergent thinking *“involves processes like shifting perspective, transforming, or producing multiple answers from the available information and thus favours production of novelty”* (Cropley, 2001: 32). However, even though both types of thinking lead to production, convergent thinking involves *‘production of orthodoxy’* and divergent thinking *‘production of variability’* (Cropley, 2001: 32). Cropley (1999: 511) defines divergent thinking as a process which *“concentrates on producing a large number of original or unexpected ideas”*. Therefore, divergent thinking tests involve scoring *fluency* and *originality* (fluency represents the number of ideas and original unique ideas) and are commonly used in creativity research (Runco, 1999). Runco (1999: 577) describes divergent thinking as *“cognition that leads in various directions. Some of these are conventional, and some original. Because some of the resulting ideas are original, divergent thinking represents the potential for creative thinking and problem solving”*.

³ The press of the environment element was less important in terms of future studies in this PhD, therefore will be only mentioned as part of the 4P.

2.2.2.2 EVERYDAY CREATIVITY OR “LITTLE C” CREATIVITY

Everyday creativity arises from people and their creative way of solving daily problems. This type of creativity has to be introduced since older people will be involved in the creative process in future PhD studies. Cropley (2001: 11) relied on applying everyday creativity to everyday problems, where someone needs to find creative solutions. Everyday creativity helps people to *“cope, increase physical and psychological health and well-being, and even further one’s self-actualization and caring contributions to the world”* (Richards, 1999a: 684). Sanders (2001: 1) claims that people employ their creativity at home, in hobbies, with friends and so on. However, Richards (1999a) argued that creativity in ordinary people is not very innovative.

Based on the above definitions of everyday creativity Bohm’s (1998, cited in; Sanders, 2001: 1) statement in that *“everyone is creative”*, as well as Norman (2003: 9) who believes that *“we are all designers”*, could be applied. Cropley (2003: 27) states that the *“production of novelty can be fostered in everybody not just the chosen few.”* However, Milgram (1990, cited in; Cropley, 2001: 11) asserts that people who have ‘ordinary’ or ‘everyday’ creativity *“never produce anything that is publicly acknowledged or acclaimed”*. Sanders (2001: 1) states that creativity in people who do not apply it in a daily routine is likely to be latent and decline over the years (Dahlberg, 2007); it is therefore necessary to stimulate it, with the use of appropriate methods.

2.2.2.3 THE 4P OF CREATIVITY

Certain authors (Feldhusen and Goh, 1995; Richards, 1999b; Warr and O'Neill, 2005b) define creativity in terms of 4P: people, process, press of the environment and product. Mooney (1963, cited in Richards, 1999b) introduced the 4P of creativity in education. More attention will be devoted to creative processes and creative product than other two components.

a.) Person

Vernon (1989, cited in Eysenck, 1996) defines a creative person as a person that has the *“capacity to produce new or original ideas, insights, inventions, or artistic products, which are accepted by experts as being of scientific, aesthetic, social, or have technical value”*. A person’s creativity can be measured by creativity tests (see section 2.2.3.1).

b.) Process

Another important component of creativity is the creative process, which is commonly used as a basic model for software-based creativity support tools (Warr and O'Neill, 2004: 59). The creative process describes how people think, feel, interact and behave in order to develop or design creative, novel and appropriate outcomes (Richards, 1999b: 733). It can also be regarded a series of steps in order to approach a problem (Best, 2006: 112). Generally, design or creative processes firstly: *“define the problem; develop a better understanding of the problem; conceptualise the problem; detail a design solution and, finally, test or implement the solution”* (Best, 2006: 112). However, these models are not linear and they have various numbers of stages, which are not strongly separated, but are linked to each other (Warr and O'Neill, 2005b). Different research areas adopt diverse creative processes. For example, in education Cropley's (2001) creative model is used, while in HCI Shneiderman's (2000) creative process would probably be preferred and in design IDEO's (Kelley and Littman, 2001). Other fields and disciplines are likely to use other approaches to studying creativity (see Table 2).

Stages in the process		Mess-finding				Immersion
	Preparation	Fact-finding	Preparation	Understand	Collect	
		Problem finding	Information	Observe		Activation of feeling and memories
	Incubation		Incubation		Relate	Dreaming
	Illumination	Idea-finding	Illumination	Visualise		
	Verification	Solution-finding	Verification	Evaluate	Create	Bicolation and expression
			Communication			
		Idea implementation	Validation	Implement		
					Donate	
Author of the process	(Poincare, Wallas 1926)	(CPS model 1936)	(Cropley 2001)	(IDEO 2001)	(Shneiderman, 2001)	(Sanders,2001)

Table 2: Some of the different creative processes (Jones, 2007).

This PhD research will use Poincare and Wallas's (Wallas, 1926) creative process because of its simplicity and clarity. This creative process was the first, being established in 1926 (Warr and O'Neill, 2005b: 120; Johnson and Carruthers, 2006: 1002). The process consists of four phases (Johnson and Carruthers, 2006):

- **The preparation** stage clarifies and develops an understanding of the problem, and involves gathering relevant data about the problem in order to find a solution.
- **The incubation** stage is the reflection on a problem where people filter information from conscious awareness to the subconscious; the problem remains as an ambient thought awaiting some creative insight (i.e. a 'eureka' moment)
- **The illumination** stage is when creative insight occurs. Nemiro (cited in 2004; Warr and O'Neill, 2005b: 120) describes this as *"a sudden change in perception, a new idea combination, or a transformation that produces an acceptable solution to the problem at hand"*. This reflects both Koestler's combination of matrices of thought and Boden's transformation of conceptual spaces (Warr and O'Neill, 2005b).
- **The verification stage** involves testing of the creative insight, idea or creative product as a novel and appropriate solution to the problem. In addition, this is the stage for testing and elaboration (Johnson and Carruthers, 2006).

c.) Press of the environment

Under press of the environment Mooney (1963 cited in Richards, 1999b) the conditions relating to participants or groups involved in the creative process and situations would affect the final output.

d.) Products

The final product can vary (for example, a paper prototype, a storyboard for a new computer game, a creative solution for a more sustainable university environment), depending on what the aim of the creative process is. The final creative outcome will be a physical outcome or a new solution (Cropley, 2001). In the case of this PhD study, Stenberg and Lubart's definition of the creative product was applied, which has to be both novel and appropriate in order to satisfy users' needs.

2.2.2.4 INDIVIDUAL AND GROUP CREATIVITY

An individual's creativity can be limited, since they can only produce ideas inside their own area of knowledge, experience and cultural background. Identification of these blocks is important in order to remove them from creative engagement.

Each individual has a certain domain of knowledge, which is a collection of matrices of thought. An individual has only the matrices of thought available in their own domain of knowledge, but groups can interact with each other, extend their matrices of thought and

make them available to others (Warr and O'Neill, 2005b: 123). Each individual, or the individuals belonging to a group, has different personality traits, which affect their creative ability; they can explore and transform their conceptual spaces and this will have a better effect on a creative product (Warr and O'Neill, 2004: 57).

Paulus (1999: 779) defines group creativity as the *“creation, development, evaluation, and promotion of novel ideas in groups”*. Guilford (1984, cited in Sosik, 1998) describes it as a group's divergent production of ideas. However, Paulus (1999:780) and Warr & O'Neil (cited in Sosik, 1998) state that groups develop fewer and poorer ideas than individuals alone. Paulus (1999:780) discussed the *'tendency towards conformity'*, which means that a group works towards the collective aim; for these reasons individuals with different opinions will get negative responses or will be disapproved of until they agree with the rest of the group. Another block that Paulus (1999) describes is the persistent effort of those individuals that are influential enough to put forward their ideas. Individuals in a group can provide information directly or motivate knowledge processes and creative styles. Paulus ((1999: 781) states that groups should have individuals with diverse knowledge and skills and be motivated to fully exchange ideas.

2.2.3 METHODS FOR ASSESSING CREATIVITY DURING THE CREATIVE PROCESS

The aim of this section is to investigate different approaches to accessing creativity during the creative process that could be applied in future studies. The first part will focus on two main areas which can be investigated to assess creativity: during the creative process, and the creative output. In the second part of this section, different parameters will be presented that can be used to measure the creative process and the creative output. Researchers adapt different approaches to analysing data during the creative process; however, none of them is an optimal solution.

Different approaches can be chosen to assess creativity; Thorndike (cited in Joncish, 1968: 199) stated that *“everything that exists in some quality can therefore be measured”*. Boden (1994, cited in Warr and O'Neill, 2005b) argues that if we are able to identify ideas generated through a creative process, it is therefore possible to develop a way to count ideas in order to measure the creativity of an individual or a group. Amabile (1990, cited in Feldhusen and Goh, 1995) suggests assessing the creativity of final product, which has to be

scored by an independent person familiar with the domain in which the product was created.

2.2.3.1 PSYCHOLOGICAL CREATIVITY TEST FOR ASSESSING PERSONAL CREATIVITY

Various psychological creativity tests applied in education, which measure creativity statistically and empirically, can be used for assessing creativity. Guilford's four creativity factors (fluency, flexibility, originality (Guilford, 1957) and elaboration (Guilford, 1959) are the basis for measuring creativity in all tests. Those factors are the most appropriate for measuring group creativity (Sosik, 1998). Torrance, with the Torrance Test of Creative Thinking (Auzmendi and Aurelio, 1996; Kim, 2007), was the first to apply Guilford's creative factors in a creative test (Plucker, 1998) and develop scoring metrics (Warr and O'Neill, 2006). Other similar tests to Torrance test are the Auzmendi creativity test called VAT, the Aurelio test (1996) and the CT Abedi-Schumacher creativity test (Auzmendi and Aurelio, 1996). Then, there are personality, biographical inventories and behaviour tests, such as the Creativity Personality Scale test developed by Gough (1979, cited in Warr and O'Neill, 2005b). Those tests (Bohm, 1998) assess creativity in various ways: visually, verbally, nonverbally, figurally, and they use various parameters, for example Torrance scores using 15 parameters. Subjects are preschool children and students (Plucker, 1998), but very rarely adults or older people.

To test participants' creativity, it was difficult to find an appropriate test for an adult or older person. The problem with these tests is that they are very specific and as a researcher one cannot conduct them. A professional psychologist is required to score them. Furthermore, these tests are more focused on the subject itself and their performance as an individual, rather than as an individual in a group or a group. In addition, Warr and O'Neil (2005b) found that these tests are not suitable for assessing creativity, but they could be used to identify some of the attributes of creativity. Based on this, it was decided to apply the CREAX Creativity Self-Assessment test (Mann and Theeten, 2002), which is accessible on-line.

2.2.3.2 ANALYSING VIDEO DATA

Two methods of analysing video data will be described below. First, Adams et.al. (2001) and Valkenburg (2000) investigated creation in product design teams, her approach based on Schön's (1983) theory '*Reflection-in-Action*' which explores design activity (process), the design task (content) and designer(s) (Valkenburg, 2000). Valkenburg (2000: 72) divided the design process into *naming* the relevant factor in the design situation, *framing* the situation

20 in a specific way, making *moves* towards solution and *reflecting* on those moves. To present this approach of analysing data, Valkenburg (2000) adapted a graphical representation of listed elements and this was a base for further and more structured data analyses. However, the author (2000: 84) found out that this kind of video analysis data has its own limitations: only actual behaviour can be analysed, not what is behind that (for example, conflict) (Baarda et. al., 1995 cited in Valkenburg, 2000). However, these authors indicated certain limitations to this approach, such as i.) fixed time period for the duration of experiment, ii.) richness of video data that demands a large amount of time, and iii.) clear vision concerning how the data will be analysed and processed.

Dorst (1997, cited in Valkenburg, 2000: 63) adopted a different approach to analysing video data while aiming to test Schön's approach. Dorst (ibid) decrypted all video data from nine designers working individually on a design task in order to test them in an empirical study. Designers were needed to '*think aloud*' so that the described conversation could be coded according to Schön's '*Reflection-in-Action*' and rational problem-solving (see previous section). Dorst (1997, cited in Valkenburg, 2000: 63) reported that this transcribing and coding approach was difficult to do. Dorst (ibid) listed the following two disadvantages of this approach. Firstly, there were problems with identifying frames, although this method required little interpretation, since the designers' words were taken as accurately describing the designers' actions. However, this process works well in the conceptual design phase when we want to know what is happening during the design process. Secondly, describing design as a reflective practice blurs the relationships between the design process, the design task and the designer.

Vaajakallio and Mattelmäki (2007: 232) adopted a different approach for analysing video data where ageing workers were recorded at their work. The purpose of analysing video data was to extract ideas for designing a mobile technology concept. Video recordings were divided into '*activity maps*' presented in A3 format with sketches of developed ideas for easier sharing and with links to video clips. Video analysis focused on the variety of work environments and physical aspects of gathered data (for example, workers start work early in the morning and they need gloves). Every worker's action was then described by scenario, which included users' and designers' ideas. These ideas with '*activity maps*' were presented with links between ideas, task and context.

None of the described approaches was appropriate to be applied for analysing data in the studies conducted; however, knowledge from these cases was brought forward.

2.2.4 PARAMETERS FOR ASSESSING CREATIVITY DURING THE CREATIVE PROCESS

Various phenomena and factors can be measured during the creative process. The most important ones are listed and examined below.

2.2.4.1 FLUENCY, FLEXIBILITY, QUALITY, ELABORATION

Guilford (1956, 1959b, 1960, 1986 cited in Kim, 2007) was the first to identify divergent thinking as a composition of four creative factors: fluency, flexibility, originality, elaboration. Guilford (1959: 170-174) established the following definitions of those factors: i.) *fluency*, the ability to produce many ideas; ii.) *flexibility* producing a wide variety of ideas; iii.) *originality* producing novel ideas; and iv.) *elaboration* adding value to existing ideas. Guilford's definition of fluency, flexibility, originality and elaboration were used for further study.

Subsequently, Torrance applied Guilford's definitions in his first edition of creativity tests⁴ in 1966 (Auzmendi and Aurelio, 1996; Kim, 2007: 4) with almost no difference from the original definitions (Glover and Gary, 1976). Warr and O'Neil (2005a: 636) also applied Torrance's parameters for measuring creativity, however they applied *fluency*, *flexibility* and *quality* only. *Fluency* and *originality* definitions remain the same in Warr and O'Neill's (ibid) paper, however, *flexibility* is defined as the number of categories of ideas that were generated and *quality* as a participative rating by two or more independent judges who are considered experts in the domain (Warr and O'Neill, 2005a: 636). The following year Warr and O'Neill (2006: 123) established new definitions based on Torrance's scoring metrics definitions from the year 1966, which were:

- *fluency* is the "total number of relevant ideas produced, and maps to our notion of appropriateness",
- *flexibility* is "the number of different approaches or categories of ideas produced"
- *originality* "considers the unusualness or 'creative strength' of the ideas, and maps to our notion of novelty".

⁴ Torrance (Richards, 1999b) is best known for developing the Torrance Test of Creative Thinking (TTCT) in 1966. The test includes 2 forms (A and B) of the TTCT-Verbal and 2 forms (A and B) of the TTCT-Figural. The test was translated into more than 35 languages; therefore, this test is highly recommended in the educational field, is the most widely used test of creativity, and has the most references of all creativity tests.

Kim (2007: 3-14) established his version of definitions for measuring creativity:

- *fluency is “the number of relevant ideas; shows an ability to produce a number of figural images”*
- *originality is “the number of statistically infrequent ideas; shows an ability to produce uncommon or unique responses”*
- *elaboration is “the number of added ideas; demonstrates the subject’s ability to develop and elaborate on ideas”*

2.2.4.2 FACTORS THAT STIMULATE CREATIVITY

Very little literature was identified in this area, however, Sosik (1998) counts positive forces, which are encouragement, stimulation, and reward among factors that stimulate creativity.

Paulus (1999:781) identified the following benefits that a group has while it is interacting:

- 1.) A group allows individuals with different educational backgrounds and expertise to exchange information and ideas.
- 2.) A group makes it possible for individuals with one interest to develop more complex ideas (a combination of ideas from different ideas) because of group information exchange.
- 3.) Intellectually diverse groups should be more likely to develop unique or creative ideas because they have the ability to combine many different sets of knowledge.
- 4.) Conflict among members can help to re-evaluate their suggestions and can result in improving ideas.
- 5.) Viewing different options, individuals can improve their approach on task.

For the purpose of the study, Paulus’s (1999:781) factors that stimulate creativity in a group were applied because of their relevance.

Stimuli or creative triggers are one of the characteristics of the creative design process. Mednick (1962, cited in Cropley, 2001: 36) states that for creativity it is crucial that *“associations go beyond the traditional, conventional or orthodox, and are ‘remote’”* and he states that *“experienced people learn a number of possible responses to any given stimulus”*. Jones et al. (2008: 290) report that the number of ideas was considerably higher than the overall average (for example, constraint removal sessions), with the use of creativity triggers. Loi (2007: 230) states that the main purpose of creativity and playfulness is deep engagement, richer discussion and better teamwork. In Loi’s (ibid) opinion creative triggers can be used to:

- i.) gain inspiration on how to 'read' and understand a context and its inhabitants – to provide nuances and insights that a conventional process would fail to develop;
- ii.) provide information about both space and people within a specific context – information that could complement and deepen data gathered via traditional means, and
- iii.) create a dialogue between the inhabitants of a specific context – enabling relationships that could foster and sustain co-operative and collaborative practices.

However, the main aim of Playful Triggers is to establish a bond, a collaborative practice, among participants: they focus on dialogue-creation, acting as communication (rather than ethnographic/empathetic) devices (Loi, 2007). Deikman (1973, cited in Loi, 2007) states that *"instead of being verbal, analytical, sequential, and logical"* this mode of consciousness is *"nonverbal, holistic, nonlinear, and intuitive"*. Loi (2007: 231) states that the aim of Playful Triggers is:

"activating receptive modes of engagement, favouring sensory over formal attributes of that engagement. These tools generate receptive modes through their tactile, visual, mysterious, playful, three-dimensional, poetic, ambiguous and metaphorical qualities and ask people to challenge taken for granted or conventional ways of doing, seeing and articulating things to co-generate shared understandings and collaborative practices."

Loi (ibid) believed that Playful Triggers need to be designed in order to satisfy four key points: *"wonderment, playfulness, learning through making and metaphors"*. Playful Triggers stimulate people by playing with artefacts (2007:231).

2.2.4.3 FACTORS THAT INHIBIT CREATIVITY

Davis (1999:156) defines barriers that inhibit creativity as *"blocks, internal or external, that either inhibit creative thinking and inspiration or else prevent innovative ideas from being accepted and implemented."* Paulus (1999:780) identified the following factors that inhibit group creativity:

- In their discussion group members tend to focus on information and ideas they have in common rather than ideas that are unique to particular individuals.

- They also tend to evaluate ideas as they are presented and this may inhibit group members from presenting novel or unusual ideas which may receive critical reactions.
- In terms of sharing group responsibility, certain individuals will reduce their own contribution and let others to do the main job.
- The background of the group can reduce the group's enthusiasm.⁵
- The members of the group are too similar in their backgrounds or when they are very different and participants are not familiar with each other's experiences and their ideas.
- Conflicts are common in groups whose members have very different backgrounds. This disagreement can inhibit creativity-productivity, although it can have the opposite effect as well.
- Premature judgment of ideas.

Davis (1999: 166) distinguished between five categories of blocks that inhibit creativity: learning and habit, rules and traditions, perceptual barriers, and cultural, emotional and resource barriers. Warr and O'Neill (2006: 123) identified three factors that inhibited creativity in their studies with nominal⁶ and real groups:

- *Production blocking* happens when ideas are expressed verbally within a group and only one person can express their ideas at the same time (Warr and O'Neill, 2005b: 124). Because of this, the person can forget their ideas or hold them back as they may feel that their ideas are less relevant as time passes. Furthermore, rehearsing ideas inwardly can prevent participants from concentrating on what other members say. As a result group members are prevented from expressing their ideas as they occur, and so may be discouraged from producing further ideas (Warr and O'Neill, 2006).
- *Evaluation apprehension* occurs when members of a group fear criticism from other group members, preventing them from expressing ideas. This may also reduce the quantity of ideas produced in groups (Warr and O'Neill, 2005b: 125). One solution

⁵ McLeod et. al. (1996) investigated creativity in different ethnic groups (Anglo-Americans and Anglo-Asian, African and Hispanic Americans) and she found out that an ethnically diverse group can produce "highly qualitative and more effective and feasible ideas" than a more ethnically homogeneous group.

⁶ Taylor (1958, cited in Warr and O'Neill, 2006:123) defines real groups as face-to-face interacting groups and nominal groups as individuals working on their own and then assembling their outputs into a collective output.

for this can be to allow members to express ideas anonymously or individually (Warr and O'Neill, 2006: 124).

- *Free riding or social loafing* can result if group members become lazy, relying on others and not contributing as many ideas as they could (Warr and O'Neill, 2005b: 125). Authors argue that this might happen when members assume the group's output has to be assessed collectively, while a person working alone is more likely to take responsibility for their own performance (Warr and O'Neill, 2006).

Von Oech (1983, cited in Davis, 1999) lists 10 mental blocks that can block production of ideas during brainstorming: i.) the right answer, ii.) that's not logical, iii.) follow the rules, iv.) be practical, v.) what if...?, vi.) avoid ambiguity, vii.) to err is wrong, viii.) that's not my area, ix.) don't be foolish, and x.) I'm not creative. However, Paulus (1999: 781) suggests the following factors inhibit creativity during a brainstorming session: i.) negative feedback, ii.) individuals do not want to make a negative impression, iii.) individuals will reduce individual contributions towards group performance, iv.) group interaction process (when others are talking and maybe someone cannot utter or produce their own ideas), and v.) limited time for the session.

Paulus's factors that inhibit creativity were selected for the purpose of measuring creativity during the design process.

2.2.4.4 FLOW

Kerne et al. (2004: 14) state that results from the creative process include direct products (for example innovation) and experiential by-products, and one of these is flow. Csikszentmihalyi (1996: 110) was the first to define flow during the creative process, and described it as "*the optimal state of experience that yields novelty and discovery*". Experience of flow occurs no matter the activity or people, gender, age or cultural background; sportsmen, artists, scientists or ordinary people describe the same phenomenon (Csikszentmihalyi, 1996: 110). For Csikszentmihalyi (1996: 111) flow is identical to enjoyment; the researcher recognizes the following nine elements of an enjoyable experience: i.) *there are clear goals for every step of the way*, ii.) *immediate feedback is given to one's action*, iii.) *there is a balance between challenges and skills* iv.) *action and awareness are merged* v.) *distractions are excluded from consciousness* vi.) *there are no worries of failure*, vii.) *self-consciousness disappears*, viii.) *sense of time becomes distorted*,

and ix.) *activity becomes autotelic*. These phenomena are conditions for flow in creativity and it can form a link with happiness, satisfaction, success and enjoyment (Csikszentmihalyi, 1996: 113).

Cropley (1999: 515) defines flow as letting ideas flow and these lead to creativity. Finally, Kerne (2004: 14) defines flow based on Csikszentmihalyi's⁷ original definition of flow, which is the following:

"Flow is an intrinsically rewarding motivational and behavioural state in which one's experiences are optimal. Flow activities "facilitate concentration and involvement." They enable people to achieve peak performance, by generating feedback that sustains engagement. ... Flow states are highest when one is successfully engaging in challenging activities. Flow occurs in activities with clear goals and unambiguous feedback. The experience of flow has been correlated with the production of creative products."

Kerne's (2004) definition was chosen to support the analysis of data in the main empirical study.

2.2.5 METHODS FOR ASSESSING CREATIVE OUTPUT

Hennessey (2003:257) states the importance of evaluating the creative *product* rather than the creative process, because any identification of process as '*creative*' has to depend on the fruit of that process, a product or response. Amabile (1987, cited in Feldhusen and Goh, 1995: 233) defines a creative product or response as a "*novel and appropriate solution to an open-ended task*". Amabile (1987, cited in Feldhusen and Goh, 1995: 233; 1983, cited in Warr and O'Neill, 2005b: 120) argues that creativity cannot be assessed only by objective analysis through participants who created the final output, but also by experts who will determine the degree of creativity in a product. Amabile and other authors (Feldhusen and Goh, 1995: 235; Csikszentmihalyi, 1996; Johnson and Carruthers, 2006) highlight the importance of the external judges who have to be "*familiar with the domain in which the product was created or the response articulated*" (Amabile, 1983, cited in Warr and O'Neill, 2005b: 120). For the product or response, Amabile (ibid) states that it "*is creative to the*

⁷ This definition is based on Csikszentmihalyi's book from the year 1988, with the title *Optimal Experience: Psychological Studies of Flow in Consciousness*, Cambridge University Press.

extent that appropriate observers independently agree it is creative". Warr and O'Neill (2005b: 120) state that the appropriateness of a product has to be assessed in relation to the setting for which the product was intended.

Jones (2008: 291) suggests measuring creative output with a questionnaire in order to identify which ideas are the most and least creative. In this case participants were asked to evaluate ideas based on Boden's (1998:347) definition of creativity which is *"the ability to come up with ideas or artefacts that are new, surprising and valuable"* and Sternberg and Lubart's (1999) definition (see next section). Participants were required to evaluate novelty and appropriateness. After developing the second prototype, Jones (2008: 291) repeated the questionnaire again with three key project experts, who had been asked to answer the question *"How much influence do you think this idea/requirement has had on the development of the APOSDLE [the project] prototype so far?"*. Field experts were recruited with the aim of evaluating the creative output of the studies carried out.

2.2.6 PARAMETERS FOR ASSESSING CREATIVE OUTPUT

Various parameters can be measured at the final output; however, this study will focus on measuring novelty and appropriateness. For the purpose of measuring creative output in performed studies, Sternberg and Lubart's (1999: 3) definition of creativity was chosen: *"creativity is the ability to produce work that is both novel (i.e. original, unexpected) and appropriate (i.e. useful, adaptive concerning task implications)"*. This definition was chosen by many other researchers, such as Maiden, N. & Jones, S. (2007) and Jones et al., (2008); however, other authors established their own definitions. For example, Boden states (1998: 347) that a creative idea has to be *"novel, surprising, and valuable (interesting, useful, beautiful...)"*. Creative output can be defined as novel when it is *"understood in both senses: physical products on the one hand, new ways of symbolizing an area on the other"* (Cropley, 2001: 16). Nakakoji et. al. (1997, cited in Johnson and Carruthers, 2006: 999) argue that it is not enough that a product is innovative but it also needs to be valuable or useful, otherwise it cannot be regarded as truly creative. Warr and O'Neill (2004: 58) established a hybrid definition: *"creativity is the combination of two or more matrices of knowledge to produce a novel and appropriate product/response"*. Warr and O'Neill (2005a: 630) define creativity as *"the generation of design ideas, to solve a given design problem, which are both: i.) new or unusual to the mind in which they arose (novelty); and ii.) conform to the requirements of the design problem (appropriateness)"* in their studies.

In the next two sections novelty and appropriateness will be examined in more detail.

2.2.6.1 NOVELTY

Cropley (1999: 512) states that creativity is *“the production of relevant and effective novelty”*. Authors (Boden, 1998: 347; Warr and O'Neill, 2004: 58, 2005b: 119 and Johnson and Carruthers, 2006: 999) distinguish between two sorts of primary novelty: *psychological novelty* (P-Novel) when *“the idea is new to the mind in which it arose, though it may have been thought of by others before”*, and *historical novelty* (H-Novel) which occurs when *“the idea is P-Novel and has never been thought of by anyone else before”*. Boden (1998: 347) states that *“any H-Creative idea is more creative than any merely P-Creative idea”*. However, artificial intelligence is primarily focused on *P-creativity*, since *H-creativity* will occur only in rare cases.

Warr and O'Neill (2004: 58) distinguish between *Individual Novelty* (I-Novel) and *Group Novelty* (G-Novel) when creativity is applied in a participatory design process. In relation to Boden, Warr & O'Neill (2004: 58) understand *I-Novel* as the same as *P-Novel*, but a *G-Novel* idea is an idea that is new to the mind in which it arose and has not been previously thought of by another member of the group. Therefore, for Warr and O'Neill (ibid) *G-Creativity* is more creative than *I-Creativity* and allows the measuring of novel ideas inside the group.

Eysenck (1996: 201) distinguished between two types of novelty: *private novelty* and *public novelty*. The first is when someone has an idea that is new to them, and the second is when the idea is new to everyone.

Suwa's et.al. (2000) definition of situated novelty for a design prototype was used for the purpose of the study. Suwa et.al. (2000: 539-567) state that situated creativity (*S-creativity*) occurs when *“a designer or reasoned has an idea for a specific task, which was novel in that particular situation.”*

2.2.6.2 APPROPRIATENESS

Warr and O'Neill (2004: 58) define appropriateness as *“what differentiates novelty from creativity,”* however, *“novelty is a necessary but not a sufficient feature of creativity”* (1962, cited in Warr and O'Neill, 2005b: 120). Mednick (1962, cited in Eysenck, 1996: 200) defines creativity as *“the forming of associative elements into new combinations which either meet requirements or are in some way useful”*.

For the rationale of the study, the WordNet (2005) definition of appropriateness was chosen, which states that: “Artefacts need to have some potential value, it must be useful or appropriate”, therefore according to WordNet (2005) they need to be “suitable for a particular ... condition” and “appropriate for achieving a particular end”.

2.3 DESIGNING TECHNOLOGY FOR OLDER PEOPLE

2.3.1 DEMOGRAPHICS

The latest demographic predictions by The United Nations (Index, 2007b) show that the world population over 60 years of age in the year 2000 was 420 million, increasing to 550 million by the year 2010 and to 1.38 billion by 2030. In 1948 only 10 per cent of the British population was older than 65; by the year 2025 will this have increased to almost 25 per cent (Brindle, 2009: 6) (see Figure 6). The UK, along with many other developed world societies, faces a huge challenge of social and economic innovation to adapt to an ageing population. Over the next 25 years the number of older people will rise by 32 per cent, with those aged 75 and over increasing by 76 per cent (Leadbeater, 2009: 54). By 2031 there will be 15 million older people (65+ years) in the UK, an increase of 4 million on 2008. The number of those aged 85 and over will more than double over the same period (ibid).

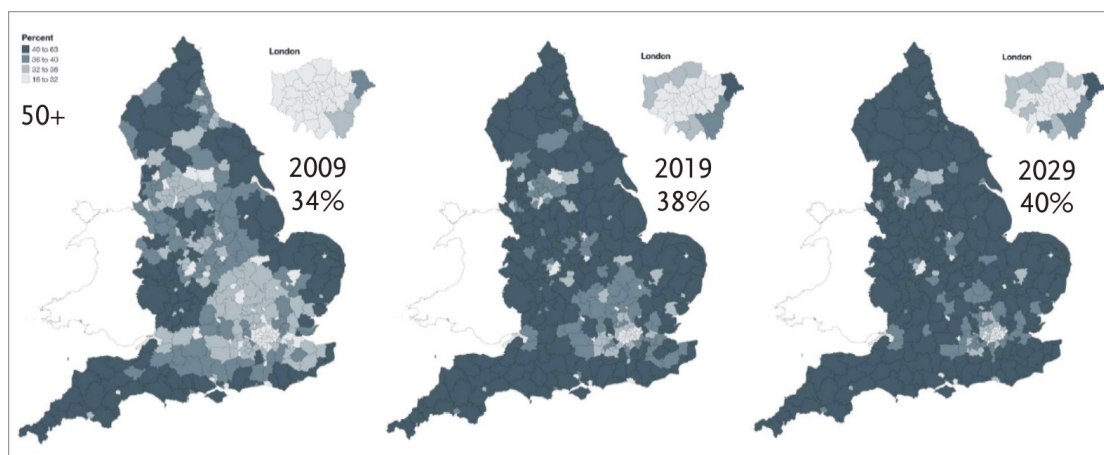


Figure 6: Older people in the UK. The number of active older people will increase in the next twenty years in the UK (Audit Commission, 2008a).

Although older age groups are clearly an important market, a lot of research has so far has focused on their chronological age as the major factor that influences their needs and requirements relating to a product. Research and design mostly focuses on overcoming physical and cognitive deficiencies or disabilities of the older age group (Healy, 2003).

2.3.2 OLDER PEOPLE'S LIFE STYLE

To understand the current situation in the area of ageing, it is necessary to introduce several trends identified in this literature review:

- **Older people are a heterogeneous group of people;** Ageing is not uniform and the majority of the older population do not have disabilities (Healy, 2003). The author divides older people into two groups: i.) active older people who are 65 years old or more, and ii.) fragile older people who are 90 years old or more (ibid). However, there is much more diversity among older people than in any other group (Healy, 2003). For example, some older people can be widowed or live alone; others suffer from disability problems or various illnesses. The experiences of men and women can also be very different (Wenger, 2001: 261), and so on.
- **Older people live longer;** in 1945, life expectation after retirement was up to 15 years. Today, we spend one third of our lives on a pension Brindle (2009: 3). However, Brindle (ibid) reports that *"by 2031, official projections suggest, there will be 57,000 people in the UK aged 100 or more"*.
- **Older people are staying on pensions longer;** therefore the British government has increased the state pension age from 60 up to 65 for men and women between 2010 and 2020, and from 65 to 68 between 2024 and 2046 (Brindle, 2009: 4). However, not all people retire at age 65. Thane (2000, cited in Brindle, 2009: 4). suggests a flexible age limit, since the capacity to work after retirement can vary.
- **Older people are still willing to contribute to society;** therefore in 2002 the terms *'productive ageing'*⁸ and *'active ageing'* were introduced (Harper, 2009: 12). The *'active ageing'* concept delivers *"opportunities for health, participation and security, in order to enhance the quality of life as people age."* Leadbeater (2009: 55) states that older people wish to remain independent, be able to feel useful, and contribute to a mutual relationship. They wish to participate in various activities, be part of a life-long relationship, and feel valued and wanted; therefore, it is necessary to focus on increasing the possibilities for older people to contribute and unite with society (Leadbeater, 2009: 54). This author (2009: 58) states that the key to living

⁸ The World Assembly on Ageing in Madrid introduced the *'productive ageing'* concept. In addition, the *'active ageing'* concept was initiated by the World Health Organisation.

successfully in someone in their late 60s to late 80s is *“to stay active, engaged and connected”*. Therefore, it is important to promote participation, relationships, contribution and connective states (Leadbeater, 2009).

- **Older people wish to live independently;** They want to manage their own lives, in their own homes, and for as long as possible; they do not want feel old (Leadbeater, 2009: 58).

Statistically the United Nations defines an old person as being over the age of 60 (Index, 2007b). In the nineties Laslett (1991, cited in Brindle, 2009: 6) established the concept of healthy retirement as the *‘third age’* and dependent living as the *‘fourth age’*. This is supported by Wenger (2001: 261) who also distinguishes older people who are still able to live independently from those who are not.

a.) Very old people (75-90 years) are described by Bjerre (2008: 2) as around 80 years and more, who experience different disabilities or chronic illnesses which can limit their lives. In addition, this group is more mentally and physically fragile; however, most of them are still able to care for themselves with medical help and the latest technology.

b.) Active older people (55-74 years) are people that Weinschenk (2008: 3) labelled as the *Baby Boomer* generation, born from 1943 to 1960. The baby boomers are an extraordinary generation; *“in the UK they number around 17 million, making up approximately 29 per cent of the total population”* (Reeves and Hannon, 2009: 60). Weinschenk (2008:3) described this generation as one which *“grew up with television and have more or less transitioned to the internet age”*. For Bjerre (2008: 1) are these young seniors aged from 55 to 75 years who are *“healthy and fresh”*. The Copenhagen Institute for Future Studies (Bjerre et al., 2008: 2) labelled this generation who are 55 or older as *“Free 2”* because they have few problems. For example, they have fewer physical and mental disabilities and shorter periods of illness, they still care for their children and they are financially more independent.

“Educated, independent-minded and well-travelled, the boomers have been pioneers of change: within the family, education system, labour market and beyond” (Reeves and

Hannon, 2009: 60). The baby boomers are certain to stay in their own home as long as possible (ibid). Weinschenk's (2008: 3) definition says that this generation "*grew up with television and have more or less transitioned to the Internet age*". From their active involvement in post-modern society and "*their starting-point in the consumer society*" Coleman (2002: 9) sees this group as "*future consumers*". Sanders (2005:5) describes them as "*everyday people, who do not want to be just consumers, but also 'creators'*". With the emergence of the knowledge-driven economies, elderly populations in the near future are going to be armed with skills (Index, 2007b).

Because life expectancy is increasing, according to Roberts (1998, cited in Healy, 2003), age will become less of a determinant of life cycle stages, lifestyles and attitudes. Future medical advances will increase longevity and its quality. Ageing consumers are developing a younger mind-set: they will live longer and have more active lives. In the future, the decade when someone was born will be a less important predictor of human behaviour. Chronological age will be less relevant in influencing the decisions that older people make; furthermore, they will be more influenced by the age they feel, their education, their cultural background and their socio-economic status (Healy, 2003).

This population is the biggest and the most heterogeneous age group. Their diversity is indicated in their occupational and cultural backgrounds, health, physical condition, and cognitive abilities and lifestyles. Coleman (2002) describes this group as having the following characteristics: i.) devotion of their attention to their family (for example, financial aid to children, baby-sitting grandchildren), ii.) higher education and financial standards, iii.) better dwelling possibilities, iv.) low-level dependence, v.) active use of free time and a healthier life, and vi.) "*a second career*" (such as active participation in social and political life). The elderly carry a lot of experience and a wealth of knowledge and connections. It is unfortunate that only a small part of it is put to good use (Index, 2007a).

2.3.3 OLDER PEOPLE AND TECHNOLOGY

In a Demos report Reeves and Hannon (2009: 65) suggest that older people use the Internet for the following purposes: "*researching family history, using genealogy sites, staying in touch with their geographically dispersed family, accessing information about health, pursuing career interests in retirement, shopping and price comparison websites*".

Older people are aware of new technology (Index, 2007a; Harper, 2009: 18) and are constantly forced to adapt to it (Harper, 2009), if they want to stay keep in touch with their children and grandchildren, to buy goods cheaper on line and so on. Harper (2009:18) reports that around half of those in their 50s regularly shop on eBay, and more shop online than the under-30s.

Younger baby boomers have been enthusiastic adopters of technologies such as mobile phones over the past 20 years (Harper, 2009), and they are entering into social networks such as 'Saga Zone'. MySpace and Facebook users aged 55+ accounted for 11 per cent and 7.6 per cent respectively of all users (Reeves and Hannon, 2009: 66). Reeves and Hannon (2009: 63) state that

"33.5 per cent of baby boomers agree with the statement that they 'are part of several networks of people who communicate and do things together', compared with 39 per cent of the older and 51.5 per cent of the younger generations".

Despite this data the Digital Inclusion Panel reported that in 2004 around *"78 per cent of people over 65 were digitally unengaged with moderate or low access to the internet"* (Reeves and Hannon, 2009: 66).

Frishberg (2009: 5) reports that earlier personal habits are often emphasized in later life, which means that people who are socially-oriented will continue online with this kind of behaviour and those who do not feel comfortable in unknown environments or who normally are sceptical about changes will continue with the same way of life. Frishberg (ibid) admitted that use of technology is just one new challenge. In addition, this author reported that use of a computer is not related to age, and it is difficult to predict who will adopt and who will avoid technology.

Weinschenk (2008: 4) found that baby boomers understand technology as a tool, and they use a computer and the Internet to complete tasks. In addition, they prefer simple, predictable and step-by-step online design. Weinschenk (ibid) reports that this generation do not use IT for pleasure or to access on-line communities. For example, they do not download much music, watch videos, or practice Internet leisure activities as much as

younger generations do. This group generally prefers to use more familiar technologies, such as TV and DVD, and they sustain their social contacts by more traditional methods such as the telephone rather than by on-line networking (Weinschenk, 2008: 4).

2.3.4 STUDIES WHERE OLDER PEOPLE WERE INVOLVED IN DESIGNING

Despite the lack of active involvement of older users in the user-centred design process, some studies have looked at how to involve this population in the design process of websites and interfaces, healthcare systems, personal calendars, interactive organization of photos, assistive technology applications, and computer games (Gaver et al., 1999; Kerka, 1999; Hawthorn, 2007).

2.3.4.1 TRADITIONAL METHODS

Many researchers use more traditional methods when they involve older people in various research projects. Those “*traditional*” methods are understood as methods that do not contain any element of creativity (for example, gathering data, stimulating or triggering creativity). For example, such methods could be interviews (Wenger, 2001), field studies (Engdahl et al., 2009), personas and narrative scenarios presented with comics (Leonardi et al., 2008) or evaluations of mock-up models of a future interactive device for older people (Sustar and Zaphiris, 2007; Sustar et al., 2008). Other traditional methods include focus groups in redesigning existing interactive systems (Hawthorn, 2007), interface design (Nilsson et al., 2003), assistive technology (Maciuszek et al. 2005) and mobile phone navigation (Goodman et al. 2004). Leonardi (et al. 2008) engaged older people in designing Ambient Assisted Living which investigated possible future technology in older peoples’ homes (for example, advanced sensor networks, interaction interfaces), which will support independent living. Another traditional method is user testing of web sites (Arch et al., 2009), web browsers (Gregor et al., 2002) and computers for older people (Newell et al., 2007). And finally, thinking aloud tests (Sayago and Blat, 2006) and interactive tutorials for older people (Hawthorn, 2007).

Nicolle and Thompson (2007) conducted a study which investigated working conditions for ageing workers in a large storehouse; the researchers applied various traditional methods, such as quantitative analysis, direct observations, semi-structured interviews, focus groups, questionnaires and various types of analysis.

The UTOPIA⁹ project (Dickinson et al., 2002; Eisma et al., 2004) concentrated on developing efficient methods applicable at the beginning of the design process for older people in the development of IT-related products for the 60 + age group.

2.3.4.2 PARTICIPATORY DESIGN

The participatory design (PD) approach was first applied in Scandinavian countries, mainly in Norway, Sweden, and Denmark (Bødker et al., 2000) in the seventies with the aim of making the design process more democratic. Local trades unions were involved in the design process to introduce the use of technology at work (ibid). In this way workers were actively involved in developing the software with the aim of designing more user-friendly software products (Warr and O'Neill, 2005a: 629). This co-operative approach successfully spread in the seventies to the USA where it was known as '*Scandinavian participatory design*' (Bødker et al., 2000). The core idea of the PD process is the involvement of users and designers in the early stages of the design process to produce creative ideas and design useful and usable products (or systems) (Warr and O'Neill, 2004). Simple creative methods employed at this early stage are usually paper prototypes, sketches, and drawings (Bødker et al., 2000).

The PD process remains primarily focused on the design activities of the software development process and consists of activities (such as analysis and evaluation) which are more analytical than creative (Warr and O'Neill, 2004: 59). According to Gennari (2000, cited in Warr and O'Neill, 2004: 59) participatory activity is a social process involving users and designers, working with and through artefacts in the design environment.

Older people were involved in the PD processes in the following studies. Massimo and Baecker (2006) involved five older people in two months' intensive PD with the aim of transforming mobile phones into a specially-designed memory aid. Nilsson et al. (2003) involved older people from old people's homes in the PD process of designing a prototype called 'Nostalgia' for listening to old news and music from the 20th century. Tiitta (2003) involved older people in a study with the aim of identifying their needs relating to communication and mobility in order to design information applications for older people.

2.3.4.3 CULTURAL PROBES

Gaver et al., (1999) were the first to develop Cultural Probes as an experimental method for collecting older peoples' experiences, feelings and memories based on diaries. The method

⁹ UTOPIA – Usable Technology for Older People – Inclusive and Appropriate

was developed as a part of an EU-funded research project (called the Presence project (Gaver and RCA CRD Presence Team, 2001)), which investigated the presence of elderly people in local communities¹⁰. The main aim of the method was “*to provoke inspirational responses from elderly people in diverse communities*”, as well as to understand the local cultures (Gaver et al., 1999: 22). The method’s main characteristics are as follows: i.) self-documentation by the users, ii.) investigation of users’ personal context perception and iii.) an exploratory character (Lucero and Mattelmäki, 2007).

After the original experiment, Cultural Probes were applied in many other ways, as professional probes (Lucero and Mattelmäki, 2007), design probes (Mattelmäki, 2006), empathy probes (Mattelmäki and Battarbee, 2002), mobile probes (Cheverst et al., 2004; Hulkko et al., 2004), technology probes (Hutchinson et al., 2003), and creative probes (Bowen, 2007). Probes were also used to widen involvement in the creative group process (Van der Lugt and Sleeswijk Visser, 2005).

Apart from the original study, the probes method was used with older people in the following contexts: older workers learning about concept design and older people (Mattelmäki, 2003); older people, including former psychiatric patients and disabled people, developing computer support (Crabtree et al., 2003); the designing of assistive technology to enable older people to maintain a high quality of life in their own homes (Dewsbury et al., 2003).

2.3.4.4 CO-DESIGN APPROACH

Older people, along with children, were involved in co-design (Druin et al., 2007), where they designed new technologies together (based on their criticism of computers that they used). Researchers (ibid) in this exploratory study applied the following methods and approaches: post-it notes (for a brainstorming session), paper prototyping, reflection and feedback on the study. Older people were engaged in co-design with their families of the interactive systems (Plaisant et al., 2006), and the game concept together with designers (Abeele and Van Rompaey, 2006). The sub-product of this research was a model of desires in older people’s lives. Afterwards, older workers were involved in the preparation stage of the design process to investigate their lifestyle and values in Active@work (Mattelmäki et al., 2007) and the Väinö project (Mattelmäki, 2003). In these projects co-design with older

¹⁰ Two design centres worked with three communities in Norway .

workers and designers resulted in using both traditional methods and innovative ones such as Design probes and Make Tools (Vaajakallio and Mattelmäki, 2007).

2.3.4.5 ALTERNATIVE AND EXPERIMENTAL TECHNIQUES

Newell (2007) used the *Interactive Forum Theatre Technique*, where older participants discuss situations performed by professional actors playing according to storyboards prepared beforehand by researchers (Leonardi et al., 2008). Newell (2007) states that this particular type of theatre encourages interaction between audience and actors about particular issues addressed by the theatrical presentation. This researcher (Newell et al., 2007) recommends the same method for gathering requirements with older people and encouraging dialogue between users and designers. However, Leonardi et al. (2008) state that this method might be costly and time-consuming.

2.3.4.6 CREATIVE WORKSHOP

No studies where older people were involved in the creative workshop were found; however, the following papers were identified where this approach was applied.

Herrmann (2009:1) conducted workshops which investigated *"heterogeneous characteristics of creative collaborations and their dimensions and the barriers that need to be overcome"*. Herrmann (ibid) based workshops on computer-supported cooperative work and employed various collaborative support methods: joint editing, shared whiteboards and so on. Svanæs and Seland (2004) completed a series of cooperative design workshops where users designed mobile systems with the help of scenarios, role playing and paper prototyping. Svanæs and Seland (ibid) adapted mobility and computer-mediated communication in workshops. Van der Lugt and Sleeswijk Visser (2007) explored the relationship between creative problem solving and the level of the users' empathy in the product development process in their workshops.

2.3.5 PRACTICAL IMPLICATIONS FOR DESIGNING TECHNOLOGY FOR OLDER PEOPLE

If developer, researcher, designers, and stakeholders want to successfully engage older people and employ their creative potential fully, certain factors have to be employed. There are existing papers which report on recommendations regarding how to involve older people in research studies, but according to Newell et al. (2007: 983) *"unfortunately, traditional User-Centred Design methods provide little or no guidance about how to involve that user group"*.

Hawthorn (2007) reports on a standard recommendation for user interface design that modifies and adapts usability tests for older people. Gregor et al. (2002: 151-152) state that older people's abilities change over time, are individualistic and culturally-oriented. Gregor et al. (ibid) compared individual variability, declining functionality, health issues, multiple disabilities, needs, environment and experiences in older people and younger adults. Druin (2007: 3) discussed different needs, physical activities, differences between groups, elaboration, complementing each other's ideas, work in small groups, time provided for discussion, rewards and the arrangement of transportation for older people and children which are important for designing new technologies. Eisma (2003: 526-527) reported on cultural gaps, language and cultural differences, the wants and needs, priorities and expectations of older people, and technology developers working for older people. Leonardi et al. (2008) mentioned the stress of travelling, unfamiliar environments and people, and convincing older people (because of their low self-esteem when using new technology) to participate in studies and discuss technological issues.

Nevertheless, the following key practical implications have been identified in research papers. Only implications related to older people will be presented, but not those related to caregivers, stakeholders or social workers.

2.3.5.1 CONFIDENTIALITY AND ETHICS

Wenger (2001: 259-276) discussed recruiting people for study, developing an interview relationship, the importance of confidentiality, how to manage those with sensory and cognitive impairment, interpersonal relations and cultural sensitivity.

2.3.5.2 RECRUITING

Newell (2007) and Goodman (2004) stressed the importance of recruiting people (in their case focus group study on navigation), as a homogenous group can provide similar experiences rather than different ones. As a result, Goodman (2004) suggests the inclusion of "*naturally occurring groups*" such as learning and get-together groups. On other hand, the same author asserts the importance of heterogeneity of the group to get a variety of experiences from the older population (Goodman et al., 2004: 84). Authors report on recruiting diverse participants with various experiences and backgrounds (Massimo and Baecker, 2006), as well as specific groups (Eisma et al., 2004). The recruiting process can be undertaken using local charities, media and volunteers who work with older people (Dickinson et al., 2007).

2.3.5.3 MAINTAINING A LONG-TERM AND FRIENDLY RELATIONSHIP

Authors (Newell 2007; Eisma et al., 2004; Massimo and Baecker, 2006; Leonardi et al., 2008; Engdahl et al., 2009) emphasise the importance of maintaining a long-lasting partnership with a particular group of older people, in order to increase trust and security. In addition, Leonardi et al. (2008) stress the importance of motivating older people for the study by drawing attention to the importance of their contribution. These authors (ibid) also emphasize the complexity of the process that cannot be reduced to a database of available participants.

2.3.5.4 THE IMPORTANCE OF STAKEHOLDERS

Engdahl (2009) stresses the importance of advertising research and using different social and specialized networks. Leonardi et al. (2008) underline the importance of advertising studies at care-givers' associations, local charities, or in the local media.

2.3.5.5 INTERACTION WITH PEOPLE

Engdahl (2009) states the importance of open interaction with older people, which can improve the conducting of the study. This can reduce the amount of psychological discomfort (Leonardi et al., 2008), and increase willingness to participate in the focus groups, creative workshops and discussions.

2.3.5.6 SMALL GROUPS

Goodman (2004: 84) stated that the size of the group (in the case of gathering information on navigation) needs to vary depending on the following factors: i.) the type of information that will be investigated (for example personal, in-depth information) and ii.) the stage in the process at which the data will be gathered. Goodman (2004: 84) and Hawthorn (2007) suggest that there should be no more than six people in a group, and any larger group should be divided into smaller groups with a facilitator. Druin (2007: 8) suggests working in small groups or pairs of older adults or children.

2.3.5.7 FACILITATOR

Vaajakallio and Mattelmäki reported (2007) that the facilitator has to *"keep their eyes open"* in order to spot opportunities for creative moments in older people that can happen at different stages of the creative process. The authors stress the importance of facilitation and the facilitator's behaviour, which has to be accurate, patient and polite (Engdahl et al., 2009). Massimo and Baecker (2007) suggested that an appropriate facilitator can be a

geriatric psychologist. Finally, Dickinson et al. (2006) report that older people like to involve a facilitator when performing a task.

2.3.5.8 FAMILIAR ENVIRONMENT

Newell (2007: 984) stressed the importance of the supportive environment; Newell is not convinced that usability testing labs are the optimal solution.

2.3.5.9 TIREDNESS (SHORT BREAKS)

Newell et al. (2007) and Eisma et al. (2004) found that older people get tired more easily and that this can limit the duration of the study. Eisma et al. (2004) argued that it is very difficult to keep attention focused on certain subjects for an extended period of time. Hawthorn (2007) reported on problems that older people had in remembering instructions, due to short term memory loss.

2.3.5.10 CLEAR INSTRUCTIONS

Dickinson et al. (2007) state the importance of explaining to participants the research methods to be used in the study. Engdahl et al. (2009) report on the necessity of countering visual impairment with the use of bigger font sizes and bold text, as well as clear, simple and consistent instructions without unnecessary details, with oral instruction being given in the same way (Dickinson et al., 2007). Messages need to be short with brief information (Gregor et al., 2002). Language consent forms, information sheets and experimental instructions all need to be understandable with the minimum of technical words and jargon.

2.3.5.11 SELF REPORTING – THINKING ALOUD

Dickinson et al. (2007) report problems when older people do not have enough experience with computers and experimental techniques, which can be stressful. Therefore, because of problems with processing, physical impairment and memorising, self-reporting can be limited, which is clear in laboratory situations (ibid). In addition, this author indicates problems with thinking aloud and suggests several alternatives, such as telling the researcher what participants did.

2.3.5.12 TIMING

Older people need additional time to study (Engdahl et al., 2009). Dickinson et al. (2007) suggest some flexibility in timing and planning additional time for task and study completion, and more time for learning. Dickinson et al. do not recommend long-term studies for older people.

2.3.5.13 REWARDING

Several authors (Dickinson et al. 2007; Druin et al. 2007; Leonardi et al. 2008; and Engdahl et al. 2009) highlighted the importance of participants being rewarded for their work after the study has been conducted.

2.3.5.14 DISTRACTIONS

Sayago and Blat (2006) report that older people did not have difficulties in general discussion with the physical computer noise that computers make or terminology, and they even played a more active role in the study than middle-aged people.

2.3.5.15 HEALTH ISSUES

Dickinson et al. (2007: 344) argue that ageing brings changes in visual and auditory perception, fine motor control and certain aspects of memory and cognition. Hawthorn (2000) states several limitations in cognitive activities that older people could perform at the same time; however, researchers highlight the following problems also related to old age:

a.) Vision

Visual impairment is one of the most obvious areas where the ageing process can be identified (Hawthorn, 2000) and often it starts in the early forties (Fozard, 1990, cited in Hawthorn, 2000: 509), with problems with near vision, visual perception and seeing fine detail. Additionally, people lose sensitivity to colours, are more sensitive to glare, are less able to adapt to change in brightness, their visual field is reduced, and so on (Owsley et al. 1983, cited in Hawthorn, 2000). Older people are less sensitive to sensing the minimal motion of objects that they are observing and have problems with estimating the speed of real objects (Casson et al. 1995, cited in Hawthorn, 2000). Their rate of processing visual information is also slower, for example recognising object fragments (Salthouse and Prill 1988; Frazier and Hoyer 1992, cited in Hawthorn, 2000). However, the level of impairment can vary from person to person.

b.) Speech and hearing

Hearing loss can make the study process confusing and frustrating for participants, especially if they have problems hearing instructions; this can lead to withdrawal from the study (Dickinson et al., 2007: 345). Fozard (1990, cited in Hawthorn, 2000: 511), Kline and Scialfa (1996, cited in Hawthorn, 2000: 511) reports that hearing with age declines in around 20 per cent of people up to 54 years old, and it increases to 75 per cent of 79-year-olds.

Older people lose the ability to detect tones, especially high-pitched ones such as telephone bells and smoke alarms, as well having problems with hearing certain letters (such as f, s, t z) (Hawthorn, 2000), which means that by 80, older people might miss 25 per cent of words in conversation. Feldman and Reger (1967, cited in Hawthorn, 2000 2000: 511) and Hawthorn (2000) report that older people often have problems coping with background noise and they are also unable follow to conversation if other people are talking in the room.

In addition, speech becomes less clear with age, because of less control over the tongue and mouth, and the reduced capability of hearing and correcting oneself compared with others (Hawthorn, 2000).

c.) Psychomotor abilities

Older people need more time to respond to more complex motor tasks (Spiriduso 1995, cited in Hawthorn, 2000; Light and Spiriduso 1990, cited in Hawthorn, 2000). However, they do not have problems with simple daily life tasks if they are planned in advance, and they can improve them with practice (for example, finger typing, experimental tasks) (Krampe and Ericsson 1996, cited in Hawthorn, 2000). In addition, they often have problems with precise movement, such as tracking a target with a mouse (Jagacinski et al., 1995 cited in Hawthorn, 2000). However, older people are more concerned about their mistakes. They also can have problems with their writing. They have less control of their bodies in the environment and they can lose touch sensitivity (Hawthorn, 2000).

d.) Attention and automated responses

Vercruyssen (1996, cited in Hawthorn, 2000) reports that older people have problems with concentration over a longer period of time. Additionally, they have problems paying attention to relevant information when the environment nearby is distracting (Connelly and Hasher 1993, cited in Hawthorn, 2000; Kotary and Hoyer 1995, cited in Hawthorn, 2000). Furthermore, older people have problems paying attention to more tasks than one (for example, writing a document and paying attention to the interface) (Hawthorn, 2000), but this is not true for training tasks, which are automated.

e.) Mental capacity – memory and learning

Mental capacity does not necessarily decline until later years (Harper, 2009: 12). Botwinick and Storandt (1974, cited in Hawthorn, 2000) report that the short-term memory slightly

declines with age, but there is stronger decline in working memory (the ability to process items in short-term memory) (Salthouse 1994, cited in Hawthorn, 2000; Dobbs and Rule 1990, cited in Hawthorn, 2000). In addition, processing visual information with short-term memory also declines (Hoyer and Rybash 1992, cited in Hawthorn, 2000). Long-term memory, which involves other sorts of memory (for example, episodic memory), also declines in older people. There is a slight decline indicated in the ability to perform memory tasks, where older people help themselves with *recognition* from previous experience; however, there is a strong decline in the ability to *recall* content (Rybash et al., 1995, cited in Hawthorn, 2000; Ratner et al. 1987, cited in Hawthorn, 2000) because of the complexity of the task.

Older people develop strategies to cope with these kinds of problems (Ratner et al. 1987, cited in Hawthorn, 2000). Denny et al. (1992, cited in Hawthorn, 2000) report that older people performed worse in *spatial memory* tasks, and have more problems remembering faces (Crooke and Larrabee 1992, cited in Hawthorn, 2000) or map routes (Lipman and Caplan 1992, cited in Hawthorn, 2000). Finally older people have problems with *prospective memory* (used to remind oneself to keep appointments), but only when complex tasks have to be performed.

There is some decline in intellectual ability (Hawthorn, 2000); however, although '*fluid intelligence*' (higher level of cognitive functions) can start to decline in the mid-sixties '*crystallised intelligence*' (gaining new skills through taught learning) continues to grow (Harper, 2009: 12). Mental capacity can be reduced partly due to lack of use, and the decreasing number of mental possibilities and activities (ibid).

Leonardi et al. (2008) adopted investigation protocol in their research project. However, Dickinson et al. (2007) state the importance of not highlighting older people's limitations or poor health, which is stereotypical and can have a negative impact on working with this group.

2.4 INVOLVING OLDER PEOPLE IN THE CREATIVE DESIGN PROCESS

2.4.1 DEFINITION OF THE CREATIVE DESIGN PROCESS

Based on the discussion in this chapter, there does not appear to be a strict distinction between the design process, the creative process and the creative design process. However, different authors have put the following definitions forward:

The design process, according to Best (2006: 112) *“consists of a series of methods that are put together to suit the nature of each design project or question”*. The designer usually works on solving a problem of the real client’s project (Best, 2006). The design process is a cyclical process with many loops, and constant questioning and creativity is an important part of this process (ibid). The design process does not encourage active user involvement (Warr and O'Neill, 2005b), however, more effort is put into bringing together different subjects, researchers, scientists and stakeholders in order to get the best possible design solution (ibid). The creative output at the end of the design process is not measured, however, it is assessed by consumers as a market product and therefore its success can be gauged by how well it sells (Warr and O'Neill, 2005b).

The creative process, according to Best (2006: 112), is *“the series of events or actions we take in order to produce an imaginative, but relevant way of approaching a challenge.”* The creative process, in contrast to the participatory process, requires active user involvement with the aim of developing a creative output that can be measured.

The creative design process can be defined as *“design activity which occurs when a new variable is introduced into the design”* (Gero, 1995: 11). However, *“such processes do not guarantee that the artefact is judged to be creative, rather these processes have the potential to aid in the design of creative artefacts”* (ibid).

However, while participatory design may be viewed as a collaborative or social creative process and PD researchers and practitioners use the term ‘creativity’ when referring to the design process, they provide little definition of what this term means and what is actually involved in this process of social creativity. Nonetheless, many researchers (Best, 2006) have argued the importance of creativity in design (Warr and O'Neill, 2005a: 629-630).

Creativity is important in design (Tylor 1958, cited in Warr and O'Neill, 2005b: 118) because

“the larger the number of ideas produced, the greater the probability of achieving an effective solution. Thus, the more creative we are in design, the greater the probability of designing useful and usable software applications and computer systems”.

Gennari (2000, cited in Warr and O'Neill, 2004: 59) describes the design process as *“human activity, involving communication and creative thought among a group of participants”*.

During the creative process various parameters can be measured, yet still researchers do not agree on how to do this. The ideas generated as the creative product can help to provide a basis for measuring or assessing the nature and extent of the creativity that has occurred (Warr and O'Neill, 2005b: 122).

In this thesis I will define a creative design process as a user-centred design process where creativity was explicitly stimulated, based on the understanding of theory and models of creativity.

2.4.2 CREATIVITY IN OLD AGE

Several studies exist on creativity in old age (Csikszentmihalyi, 1996; Linndauer et al., 1997; Cropley, no date) relating to creativity in scientists and older artists in their late eighties. Kerka (1999) considers creativity in adulthood the ability to create one's own opinion, aspirations for psychic wellbeing, problem solving, improving the quality of daily life and understanding one's own physical limits. Csikszentmihalyi (1996) defines creativity in old age as the ability to manage with physical and cognitive changes, routine, personal characteristics and to manoeuvre between different areas. Cohen (2008:8-9) distinguishes four stages of creativity in adulthood: i.) re-evaluation, ii.) liberation, iii.) the summing-up, and iv.) encore phase. The last stage is based on the older person's combination of chronological age, history and various circumstances. Cropley (1999: 514) mentioned three stages of creativity: i.) the preconventional (up to ages 6-8 years), ii.) conventional (from 6-8 to 10-12 years) and iii.) postconventional (from approximately 12 years to adulthood). Older people's goals and lifestyles are more or less the same as they have always been (Cohen et al., 2008); the same is true with the quality and quantity of their skills, which can vary

slightly throughout their life (Csikszentmihalyi, 1996). If older people have a unique lifestyle and are doing some sort of creative work, this will persist until the end of their lives (ibid).

2.4.3 EXAMPLES OF INVOLVING OTHER TYPES OF PEOPLE IN THE CREATIVE DESIGN PROCESS

There are many studies in existence where older people were involved in a co-design approach, alternative and experimental techniques, participatory design, etc., but no-one has looked at how to involve older users in the four-stage UCD design process using different creative methods to design better products for older people. Other types of people have been involved, but older people have not and this will be the key contribution of this thesis. In general, it is important to state that in the literature no similar studies to the current one in this thesis were identified. However, the following similar studies have been conducted.

Warr and O'Neill (2005a: 630) conducted experiments which investigated creativity in design and the effects of operational mechanisms in '*real*' groups (groups interacting face-to-face) and '*nominal*' groups (individuals working on their own and then collating their output to form cumulative output). Their findings show the positive effect of creativity in '*real*' groups, which performed under certain conditions slightly better than '*nominal*' groups. However, Rotter and Portugal (1969 cited in Warr and O'Neill, 2005a) state that in their study *nominal* groups performed better than the *real* ones.

Kristensson et al. (2004) conducted studies where ordinary, advanced IT users (technology- and computer- trained) and professional service product developers were separately engaged in a creative design process to design future mobile phone services. In the studies the researcher investigated how original, valuable and realizable the final output was.

2.5 CONCLUSIONS

In this thesis I will explore ways in which older people can be involved as equal partners in a creative UCD process.

3 STUDY 1: EVALUATION OF THE VIRTUAL GARDEN

3.1 INTRODUCTION

This chapter reports and evaluates results from an MA project completed by the author at the University of Ljubljana, Academy of Fine Arts and Design (Slovenia) in 2005. The mock-up model (the result of a design process), which presented an interactive device for older people, was designed with a design process which did not involve an evaluation stage. Therefore, the decision was made that it is necessary to first test whether the design concept is appropriate for older people at all. Thus this decision was the foundation for the first preliminary study – evaluation.

This chapter will focus at the beginning on the methods that were applied to design the future design concept. This will be followed by an explanation of the mock-up model. The mock-up model will be evaluated in the second part of the chapter. The applied method, participants, apparatus, materials and procedure for the evaluation will be explained in this section. Finally, the results from the evaluation will be discussed.

3.1.1 THE BACKGROUND OF THE STUDY

The design process in the MA project (Sustar, 2005) included the following design stages: i.) the state-of-the-art phase and collecting information stage, ii.) the design and iii.) the building of the mock-up model stage. Three methods were applied during the collecting information stage of the interaction device for older people (ibid). The methods applied were:

- a.) Unstructured interviews were carried out with ten residents (females between 55 to 85 years) of a medium-sized residential home for older people in Slovenia.
- b.) The personas of five different users were constructed, based on knowledge from the unstructured interviews (Dekleva et al., 2002). Each persona was portrayed with age, occupation, any diseases and disabilities they had, hobbies, social networking, place of living, and use of technologies in daily life (see Figure 7).
- c.) Six middle-aged participants from the following occupational fields attended a brainstorming session: architecture, journalism, design, engineering, economics and computer programming. The professions were in some way related to the design project. An educated and independent 76-year-old single female, who for most of

her life had worked on a small farm, represented the older people. In the first part of the brainstorming, participants established guidelines for the new design idea; in the second part they developed ideas for the new future design concept (Sustar and Zaphiris, 2007) (see Appendix 1).

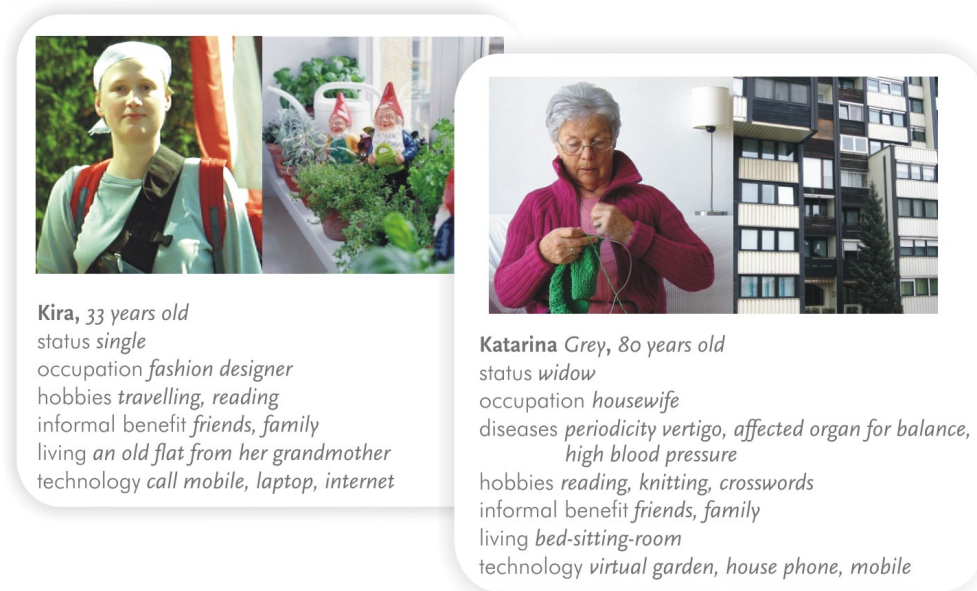


Figure 7: Use of personas in the MA project. A young fashion designer and an 80-year-old as an illustration of employment personas in the study.

3.1.2 MOCK-UP MODEL: THE VIRTUAL GARDEN

The mock-up model, named the 'Virtual Garden', was the result of the future design concept (see Figure 8). The model is a non-functional device, which aims to support an emotional interaction between the (older) person and the device. Interaction with the device is similar to caring for a normal (natural) garden. A person can manage their residence (smart house) and perform different tasks and services, for example, online shopping. The main interactions occur between the user and the device by touching the "*plants*" (object F), and by the user changing their position in the central computer (object J). Some of the gadgets, like the communication devices (objects A and B), follow the wearable interface style, others produce sound and change colours (object G), record smell (object E and D) or record the natural environment (object C) (Sustar and Zaphiris, 2007).

The mock-up model has four groups of tools, where each group has a particular purpose: the communication devices group (1) establishes interaction between various users; for

example, an older person and carer (objects A and B). The diagnostic tool (object K) confirms the gadgets can be used at the main computer. The transformers of information (3) transform information in way that the users can more easily process (e.g. objects G and I can provide information about the weather) and provide information on the residence (smart house) (e.g. object H operates as a sensor, which identifies humidity in the air). The information recorders (4) record various types of information, such as smell, events and so on (objects C, E, D) (see Figure 8). The mock-up model was made from raw materials such as wood, foam, fibreglass and plastic (see Figure 8).

In order to provide the Virtual Garden with adequate information, it needs to be connected to the Internet. The device then interprets information for the user in a simple and understandable way. The user is connected with the service information and content service providers which maintain various services that the Virtual Garden provides. The user can decide which gadget will apply, depending on their needs. For more information on technical support and the relationship of the Virtual Garden with other devices in the smart house see Appendix 2.

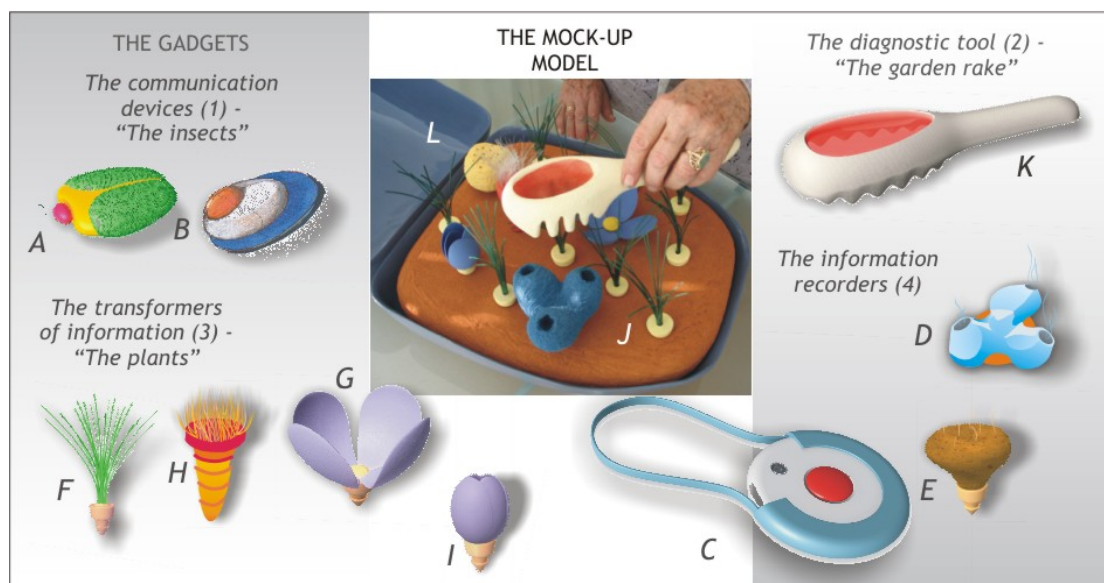


Figure 8: Mock-up model: a detailed description of the mock-up model used in interviews, with all related tools.

3.2 AIMS AND OBJECTIVES

Since the output of the product design process, the Virtual Garden, was not evaluated as a part of the MA project, it was decided that it was necessary to conduct an evaluation as a

preparation for the work reported in this thesis. The evaluation aimed to obtain a valid response from potential users as to how appropriate and functional the Virtual Garden was. The aim of the evaluation was as follows:

to investigate how different age groups regarded the mock-up model designed by the designer in the product design process, where the user is not normally involved.

To fulfil this aim, three areas of the participants' acceptance of the model were investigated: i.) the participants' familiarization with the device and its various parts, ii.) the participants' opinion of the mock-up model and, iii.) the model's ability to support older people's needs. This investigation raised several sub-questions:

1. How do different age groups evaluate forms, colours, shapes and the size of the mock-up model? and

How understandable is the mock-up model to different age groups?

The interest in this section was particularly concerning:

- i.) What do the different objects of the mock-up model represent to participants?
- ii.) What do participants think about the materials, shapes, colours and size of the mock-up model?
- iii.) Can participants imagine the model as a real device that can blink, glow, generate sound and change colour?

2. What is the participants' opinion (criticism) of the mock-up model?

The emphasis here was on:

- i.) How do participants understand the interaction with the mock-up model?
- ii.) Would interviewees use the model at home or at work?
- iii.) Can participants see themselves as potential users of the device and if not, who do they think the potential user would be?

3. How appropriate is the mock-up model for supporting older users' needs?

The last section was intended to investigate the model's appropriateness for users' needs:

- i.) How can older people adopt the mock-up model to different situations?

3.3 METHOD

In this study semi-structured interviews (Sharp et al., 2007) were conducted in pairs, enabling each person to be stimulated or reminded by the other. This method has advantages over the “think aloud” method (Dumas and Redish, 1999) where participants are not reminded in the same way. “Quick and dirty” evaluations (Sharp et al., 2007) based on scenarios were employed to formally evaluate the mock-up model, as described below.

3.3.1 DESIGN

The first preliminary study consisted of nine semi-structured interviews conducted in pairs and lasting one month - from the middle of January until the middle of February 2007. The study involved three sets of people: the very old people (from 74 to 90+ years); the active older people (from 60 to 65 years), and the postgraduate students (from 21 to 26 years) including one PhD student, who was 27 years old.

The participants were recruited from five different institutions in the central and northern part of London. The four oldest participants were recruited with the help of a facilitator who led and facilitated entertainment meetings for older people at the Vintage Club in the Muswell Hill area (North London). In addition, three active older participants, who were employees of the Guy Chester Centre in Muswell Hill, were included. The fourth older active participant was engaged at the Drivers Day Centre, which is a part of Age Concern in Islington, London. The nine postgraduate students were recruited from the Chester House Halls of Residence, an international student home in Muswell Hill, and the PhD student was recruited from City University London.

The semi-structured interviews were conducted in locations which were the most convenient for the older and younger participants: in the international student home, a care home for older people and a day centre. All participants who participated in this study were voluntary. In order to ensure that the evaluation would get the most appropriate format, the pilot study was completed before the actual study.

3.3.2 PARTICIPANTS

The recruits were divided into the three different age groups:

a.) The very old people

This group included four members of the Vintage Club, who were aged from 74 to 90+ years old. The participants comprised a very old couple, both over 90 years old, and two very old independent females. The first interview with the couple was conducted at a care home for elderly people, since one of the participants lived there and was not very mobile (he used a walking frame) (see Figure 9). The second interview with the two females was undertaken in an International student home close to independent dwellings for older people, where one of the interviewees lived.

These participants had not used any kind of modern technology in their daily routine (such as a computer, the Internet or ATM machine) apart from household appliances and a landline phone. They were also not willing to adopt any kind of new technology, preferring to use ones they were already familiar with.



Figure 9: The very old people: two of the very old people in the nursing home where they attended evaluations.

b.) The active older people

This group represented the Guy Chester Centre employees at the Chester House Halls of Residence (active older people from 60 to 65 years) and one member of the Drovers Day Centre (64 years old). Interviewees in this user group were a couple, and one male and one female person. Interviews were conducted in the Guy Chester Centre International student home and at the Drovers Day Centre. The three participants interviewed were using various modern technologies in their daily life; for example, computer, laptop, mobile phone, the

Internet, digital camera, GPRS and various on-line services, such as tele-banking, tele-care and food delivery. The fourth participant only used a mobile phone.



Figure 10: Two active older people in their working environment, during the evaluations, surrounded by various technologies.

c.) Postgraduate students

All postgraduate students and the PhD scholar were living in Guy Chester Centre and were using the newest technology (e.g. laptop, iPod, Skype)¹¹. None of the older interviewees had any severe health problems (such as dementia, deafness or visual impairment). All three groups of participants had informal and formal social contact with different age groups.

3.3.3 APPARATUS AND MATERIALS

Throughout the evaluation the following elements were used:

a.) Apparatus

- Dictaphone for recording audio data
- Video camcorder (with video camcorder tapes and tripod) for capturing video information
- Digital camera for taking photos

The same apparatus was applied in all locations where interviews were conducted.

b.) Materials

- Explanatory Statement (see Appendix 3)

¹¹ Besides the use of technology, the last two groups of participants were required to have some experience of gardening.

- Informed Consent Form (see Appendix 3)
- Questionnaire¹²
- Mock-up model (see section 3.1.2)
- Interview questions structure (see Appendix 4)

3.3.4 PROCEDURE

The participants were informed about the content of the interview, and the aims and objectives explained. They also signed the Explanatory Statement and the Informed Consent Form. Firstly, various parts of the mock-up model were demonstrated to participants without any additional explanation. Almost always, the participants spent the first 15 minutes interacting with the mock-up model. They enjoyed this and were fascinated by the model, but at this stage they were not able to answer any questions. After this initial enthusiastic stage, they were asked the first question from the first section of the semi-structured interview. The content of the semi-structured interview was divided into three main sections, which followed the objectives.

The first part concentrated on the users' familiarization with the mock-up model and its visual and physical appearance, especially:

- i.) participants' recognition of the mock-up model as an interactive device
- ii.) users' opinion on its visual appearance
- iii.) people's ability to imagine the model as a device which can emit light effects, produce sound or change colour.

In the second part, participants were encouraged to express their opinions on (or criticism of) the model. In this section the focus was on:

- i.) users' interaction with the model
- ii.) possession of the device at home or at a working place
- iii.) who the potential users will be.

The third part of the interview focused on participants' adoption of the mock-up model as an interaction device in their daily routine. Participants were encouraged to demonstrate how they would employ the mock-up model in three situations:

¹² Before participants began an interview they had been asked to fill in a questionnaire; however, this questionnaire was not relevant to research aims, therefore the results were not included in this section.

- i.) having a conversation with a friend or relative
- ii.) being reminded of something (for example, to take medicine)
- iii.) using the device in managing the smart house.

The interviews lasted from 20 min to 1.5 hours, depending on the participants' motivation. If participants were not highly motivated, they were asked questions that encouraged their thoughts. If the participants showed a low level of interest in the study, the third part of the interview was not conducted.

3.3.5 ANALYSING QUALITATIVE DATA AND CODE SCHEME

The method applied when analysing qualitative data was based on Pfeil and Zaphiris' paper (2007)¹³ and (Thomas, 2003)¹⁴. Firstly, interviews were transcribed into Microsoft Word; during the transcription process video and audio data were applied. Along with the transcribing process, comments relating to participants' interaction with the model and its behaviour were added (for example, whether the participant was bored, what their engagement with the mock-up model was, and so on). Afterwards, the transcribed interviews were imported into MAXqda2 software where they were read thoroughly for the first time with the intention of increasing familiarity with the data, and obtaining a first impression about the participants' responses (see Appendix 5). In the second reading repeated sentences were identified and coded. Finally, in the third reading specific statements were transferred into sub-codes. Through this analysing process, coded statements were organized into the three main groups of codes with sub-codes, which followed the structure of the semi-structured interview:

a.) Familiarization with the mock-up model: users' acceptance of the mock-up model visually and physically:

a) Object reminds me of ...,

The user stated what certain parts of model reminded them of.

b) Materials, shapes and colours

¹³ This paper used a method for analysing patterns of empathy in online communication at older population (Sustar and Zaphiris, 2007).

¹⁴ Based on this paper, an inductive method based on interpretation of the raw data was applied.

The participant expressed their opinion about materials, shapes and colours of the model.

c) *Imagine / not imagine object blink, glow, produce sound or change a colour*

If the user was able to imagine the model as a device which can blink, glow, produce sound or change colour.

b.) User's opinion (criticism) of the mock-up model:

i.) *Participants' interaction with the model*

In these statements participants expressed their criticism or satisfaction with the model.

ii.) *Criticism: negative/positive*

This code marked statements where participants expressed negative/positive criticism about the model.

iii.) *Who is a potential user?*

Under this code, statements were collected when participants gave an opinion about the potential users of the device.

c.) Adoption of the mock-up model as an interaction device in a daily routine

i.) *Model supports the situation*

Statements described situations where the model was successfully applied.

ii.) *Model does not support the situation*

Statements user gave when model did not support the situation.

The most relevant statements under certain codes were chosen to illustrate the results.

3.4 RESULTS

The results from the first part of the evaluation, concerning familiarization with the mock-up model, are presented only in a short descriptive form. Data concerning users' opinions and adoption of the mock-up model are represented in more detail, since they relate more closely to the research aims. Extracts from the transcriptions have been included to illustrate the main findings.

3.4.1 GENERAL RESULTS

a.) Familiarization with the mock-up model

In this part of the interview all three age groups did not have any difficulties with the recognition of various parts of the model; the mock-up was seen as a representation of a natural garden or children's toy. However, certain differences among groups were indicated. The very old people did not see technological devices, but they were reminded of kitchen utensils, kitchenware, daily care items and food. In particular this group had a problem in distinguishing between a real garden, the non-functional mock-up model and the functional interactive prototype. The Guy Chester Centre employees saw the mock-up and its parts as various technological devices, such as a new sort of CD player, a small personal CD or MP3 player, or a seismograph (object C, Figure 8). Similarly, students regarded the model as already existing or the newest technology: for example, they saw object C as a radio that can be used in a shower, then as a sensor with a button to control someone's movement or a remote control for watering a garden. In addition, they thought that object C could be a hanging light, a speaker or a Tamagotchi. The PhD student mentioned that the mock-up reminded him of a tangible version of the virtual community; furthermore, the "plants" could be a multimedia iPod with sound, smell and visual (photo) information.

In general, all of the interviewed groups pointed out that they wished that the model could provide more interaction, such as voice, transformation (for example, the ability to grow), smell, glow and change colour. Furthermore, they all agreed that the model should be more "beautiful", organic or designed in a traditional way to be more appealing to the older population.

b.) User's opinion (criticism) of the mock-up model

All three groups were fairly critical of the model. They agreed that it was too large to keep on a window ledge or on the table. None of the groups were able to perceive older people as potential users, since they thought that the design of the device was too childlike and only the students were able to identify how the elements of the mock-up model interacted.

c.) Adoption of the mock-up model

Older participants were not able to adopt the model to the required situations; however, it seems that the students did not have a problem with this. The very old people were not able to complete the second part of interview completely; therefore the third one part not

conducted. Apart from one male participant, no one in the second group of older people was able to apply the mock-up and its parts to the situations that were requested (having a conversation, being reminded of something and adopting device in managing the smart house). Students did not have these difficulties, as they were able to adopt the model in two situations (making a conversation and being reminded); however, they were not convinced that the device would be able to manage the smart house.

3.4.2 THE VERY OLD PEOPLE

a.) Familiarization with the mock-up model

This group of users did not have particular difficulties with familiarisation. They did not recognise the mock-up as a technological device, and understood it as a garden or a children's toy. They also mentioned different objects related to gardening (for example, a garden rake). Furthermore, the model reminded them of different life experiences (for example, from childhood, events related to nature and British garden culture), life situations and events (the generation gap between them and their grandchildren, seeing a plastic flower model for blind people at exhibition) and past memories. However, none of the pairs interviewed were convinced to buy this kind of device to have it in their home. The main reason for this was that it was too big and they could see no use for it.

b.) User's opinion (criticism) of the mock-up model

This group of users had considerable difficulties with accepting intuitive interaction with the model. Therefore, both pairs were not able to imagine the mock-up changing its appearance, and distribute information in a different way, as they were unfamiliar with it. Below is an example which illustrates how this group of older people could not understand intuitive interaction with the mock-up model:

R (researcher): *When the information is coming to the garden¹⁵ the flower changes colour.*

P (participant): *Changing colour? No.*

R: *Why not?*

P: *I can't think that information is coming through different channels. Do you mean that they have some sort of soul? I can appreciate the garden and look at it and it will tell me something?*

R: *Yes.*

P: *You do. That is a totally new thought. I know that flowers respond to love, if you care for them, they say. I never thought that a plant can return any information, I wouldn't be aware of that.*

¹⁵ Participants called the model a 'garden'.

The reason for this situation could be a technological gap, since these participants were not using any kind of modern technology such as the Internet or a computer. This technological gap can be illustrated with the following example:

P: The Internet is a foreign language for both of us [P and his wife]. It is too imaginative for me. In fact I don't know really what it is. I understand that it is far, far bigger than I thought it was. I just thought it is a matter of gathering information, but it does serving too. So that is far from us, we are limited. As I said because we are old, we can't adapt so quickly and we don't want to put energy to try to adapt. We are left on the shelf.

Participants prefer to use devices that they are familiar with (for example, landline phone, microwave, toaster) and they are not often willing to learn something new. This situation can be illustrated with the following example:

R: Then, you prefer listening to a radio because you already know it works?

P1: Yes. I know what things look like and I am not forced into something new.

c.) Adoption of the mock-up model

The mock-up model was not successfully adopted for this group; participants could not see themselves adopting the model for any of the required situations. Furthermore, they had no desire to accept a new way of applying devices, as they preferred to use familiar technology or to complete tasks manually. Here are three examples that illustrate this point:

Example 1

R: Imagine that you are communicating with your relatives with the use of these gadgets?

P: I have a mobile phone. This is a better way of communication than through your garden.

Example 2

R: Can you imagine that the garden could remind you to call a friend?

P: At this moment I would rather write it down. In the beginning of the weekend I look at my diary. I take a sheet of paper and I put down all small things; first the main things and then I put them in the order or I put them around something that I can remember and I'm looking at day by day. So, at that moment I will not buy it.

Example 3

R: Can you imagine that the garden could remind you to take a pill?

P: I have a little box and there are all days of the week and times: morning, noon and the evening. The chemist puts the pills in that. I can take them every morning and evening.

To summarize, this group did not have any problems with the familiarization of the object: they understood it as a garden and as a toy, but they did not recognise it as an interactive device. Therefore, it was difficult for them to imagine the model as an object that could deliver certain information with sounds or changing colour. Equally, participants were not able to apply the mock-up in any of the three required situations. They were not sure what its purpose was and had some criticism of its size. They would not own it, and they could not see themselves as potential users (see Appendix 6.3.2).

3.4.3 ACTIVE OLDER PEOPLE

a.) Familiarization with the mock-up model

Participants became familiar with the model immediately; they recognized it as a children's representation of a garden and they did not have any difficulties with the recognition of additional elements of the mock-up either. A couple mentioned that the model made them think of an animated, originally French TV series for children called *The Magic Roundabout*, and that certain elements reminded them of underwater vegetation (object H and D, Figure 8). This group wished that the model was more realistic with regards to the meaning of colour and texture (for an example like artificial flowers). Finally, interviewees were able to imagine changing and transforming the mock-up, although they had some reservations, for example one of the users was not sure that blinking would be an appropriate light signal.

b.) User's opinion (criticism) of the mock-up model

Participants were not positive about the amount of gadgets and they saw the interaction with the device as old-fashioned; they preferred buttons and a lot of different options (in this context one of participants mentioned the company Bang & Olufsen). They were not convinced that the user would be able to establish an emotional attachment. One of participants said: *"It is not like a cat or dog ... because it is not alive. If it dies you can go in a shop and buy another one. It doesn't matter"*. If the user could get more information, participants thought that it might be different. In their opinion, for older users the interaction needed to be simple to be appropriate.

Participants were not able to imagine themselves as potential users, or have the device at home. They would rather talk about other "older" users than themselves, children (for example, their 10 year old grandchildren), and children and people with disabilities, such as blind people or people with cognitive problems. The reason for this is the model's visual

appearance, which reminded them of toy or education equipment. This can be demonstrated by the following example:

P: We are still working, we are active, and we are familiar with technology that is coming out now, we still use the DVD very often. But, when the people get in their seventies like my mum, they will think that it could be a little bit childish. People who talk to you will always talk about other people who are older or have a disability ... This might not be just for elderly people I can imagine that it will be quite interesting for people who are mentally challenged.

R: Would you use this device in your daily routine?

P: People might enjoy it, but I can't see my mother or me, but you can find people that would enjoy it. Not each day, maybe occasionally, but not each day. [The participant's mother was in her eighties.]

c.) Adoption of the mock-up model

The third part of the interview was not conducted because the couple was not certain about the model. The female participant was not able to see herself as a potential user. However, she suggested using the model as a reminder to take medicine:

R: Do you think that the device could remind you of something for example, to take medicine?

P: Oh, I see what you mean; when you take a tablet you remove the flower (object G), if you remember to take a tablet and remove one item each time, then you could use the device like that. On the other hand, you can use a little pillbox for each day. It can be difficult for the older people to open a pillbox so; this is probably a good idea.

However, the same person was not able to imagine using a mock-up as a communication device:

R: What about communicating with the family using these gadgets?

P: I don't quite know how you are thinking to communicate through this. I know that it will connect with the Internet the whole time, but how you will get them to use it, how you will use e-mail facilities through this?

R: I was just thinking of a simple task, for example, conversation.

P: Just talking. But we have the telephone.

An exception was a male participant who was able to imagine the model as a reminder to take medicine or to do some shopping. Below is an example of taking medicine (see Figure 11):

R: Can you imagine taking pills each day? Do you think that model can remind you to do this?

P: Yes.

R: How? Do you have any idea how?

P: Let say that you are taking four to five different pills. This is your aspirin that you need to take at your breakfast time. (P showed object G and put it the object J.) Then you have another two that you need to take for breakfast. (P showed two objects F and put them in the object J.) Maybe you need to take a bit of carrot (P put object H in the object J.) And in the middle of the day those things remind you because they are in the garden, but when you have taken a pill, then you remove them from the garden. And at the end of the day you just replace them for the next day. But, you need to imagine a story and remember what you need to do during the day. If you imagine a story that this represents, you will know that this needs to be done at a certain time of the day. (P suggested division of the mock-up model into two parts for morning and evening pills.)

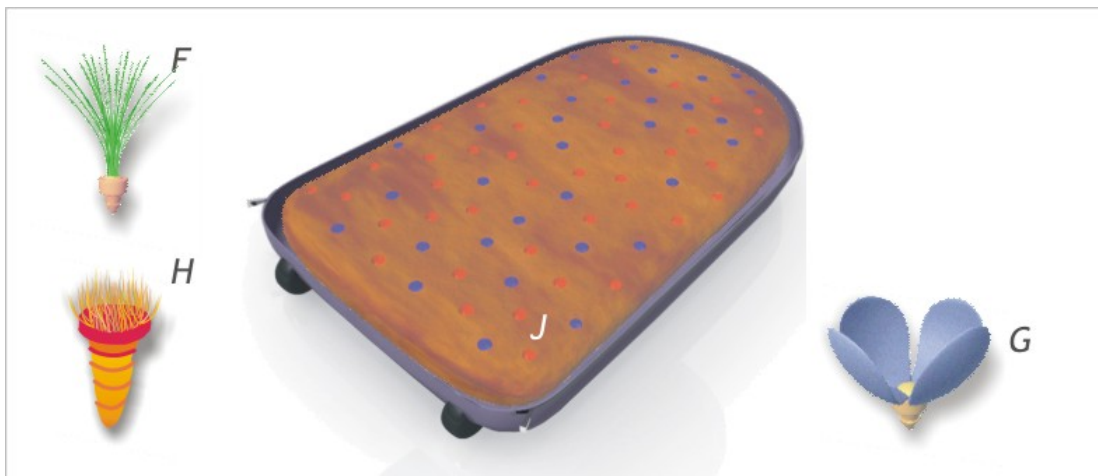


Figure 11: The Virtual Garden objects: in their imaginative story, participants used different parts of the Virtual Garden to show how the model can work as a reminder.

To conclude, the older people accepted the mock-up as only a garden for children, although they were able to see it as a technological device. Apart from this, they were able to imagine the device transforming, but with some reservations. Participants certainly did not see themselves as potential users, as interaction with the device was very unattractive and too simplistic for them; they preferred something more advanced. In their opinion, the most appropriate users would be much older or disabled people, children, but not teenagers. In spite of this, they were able to imagine the model used as a reminder or a communication device (see Appendix 6.1.3).

3.4.4 THE POSTGRADUATE STUDENTS

a.) Familiarization with the mock-up model

Familiarization was not a problem for the postgraduate students; the mock-up reminded them of existing futuristic technologies. In addition, they understood and accepted the interaction with the model; they also did not have any difficulties imagining transforming it, and they saw it as an intelligent toy.

b.) User's opinion (criticism) of the mock-up model

The interviewees thought that the design of the mock-up model was childish and therefore they would not possess it. They would own it only if it was visually attractive and if the interaction with it was more complex. In their opinion, the single design of the mock-up model could not satisfy different age groups. If the device could provide a variety of information and offered interaction in an attractive way, the most appropriate users would be children, but not teenagers or older people. For this population the model should be more realistic, natural and designed in a more traditional style. Below is an example of the postgraduates' opinion:

R: Who do you think that might use this garden?

P1: I think older people, from practical things like the temperature, or reminding them about things, if that is the problem that old people have but I think that they want it to be more naturalistic. This physically looks like a toy; young children can play with it. I think that it will need to be adapted for older people. Young adults and adults would like a more modernistic look.

P2: I think older people wouldn't like it, because it is too modern.

c.) Adoption of the mock-up model

Students understood the model more as an entertainment device than something more meaningful. However, they had no problems with adopting the model as a communication device that could successfully replace a phone or a computer (see Figure 13), and a reminder to do the shopping. In addition, they believed it could function for older people with dementia. Below are two circumstances where the model was successfully adopted:

Example 1

R: Can you imagine communicating with your family, friends or grandparents through this gadget?

P1: So you can use it like a replacement for a phone?

R: Yes.

P1: Oh, yes. If it has the function of communication I prefer this, because this is so pleasing where the computer is not. If you could speak through it this it is like a receiver.

P2: *La, la.* (P2 is singing in the object E.)

R: *Can you show me how you will use the objects?*

P1: *This can have a camera on it.* (P1 shows object D in P2' hands.)

P2: *Like a web cam.* (P2 of object D.)

P1: *This is a speaker.* (P1 points to object D.) *Or maybe this even can represent who is at home.* (Points to Objects F) *So, you have 5 people in the family and only 3 are at home. Other people could know who is at home.*

P2: *One of your friends could be in Moscow another, other one in Milan and one could say: "Hi, can we communicate?"*

P1: *And maybe they are lit up; maybe in individual colours.*

P2: *O yes, and when they are speaking it will glow.*

P1: *That would be really cool. I think that is a better purpose then just a garden. If it has technological uses then it is... this one is really good. I like it.*

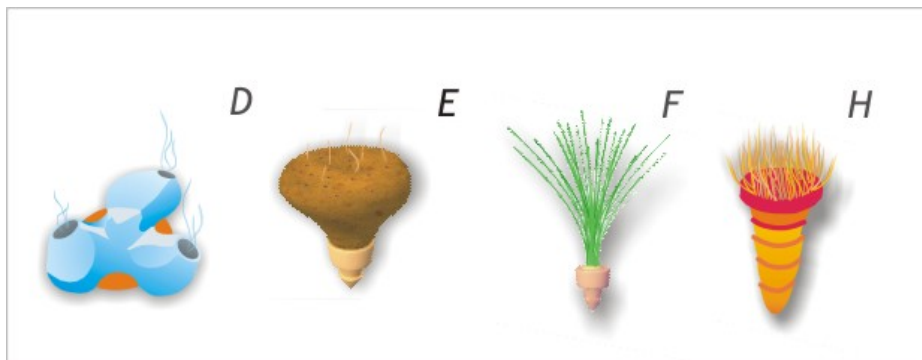


Figure 12: The Virtual Garden objects: students adopted four tools from the Garden set.

Example 2

R: *Do you think that model could remind you of something that you need to do during the day?*

P1: *Half of each symbolizes something and everything is connecting. For instance the carrot (P1 thought object H) symbolizes shopping and in the morning you will pass the garden and the carrot would light up.*

P2: *Certainly for older people who have a brain disease, it can remind them: "Eating time!" or "Go to the toilet!" or "Call your mother!" it can remind them about simple daily activities.*



Figure 13: The students: two students demonstrate how it would be possible to communicate using the mock-up model.

On the other hand, they were not able to appreciate the model as a device that is able to manage a smart home, and they would prefer to implement an existing technology. Below is an example to illustrate the case:

R: *Do you think that those things can be connected with a house?*

P: *That could be a fire and smoke alarm.*

R: *Why?*

P: *Because these do not look like sensors; maybe they can check the air for smoke.*

In brief, the students did not have any difficulty with recognition and acceptance of the mock-up model as it was, and they related it to existing or future technology. Furthermore, they liked its interaction, although they would prefer a more complex interface. Moreover, they were not convinced that the design of the mock-up was suitable for an older population and they thought the model suited children more. Therefore, they suggested a more natural and old-fashioned style might suit older people. Finally, students were able to adopt the mock-up model in two situations: as a communication device and as a reminder. However, they were not able to see it being used in a domestic environment (see Appendix 6).

3.5 DISCUSSION

3.5.1 BACKGROUND INFORMATION: RESEARCH AIM

This preliminary study set out with the aim of assessing how different age groups understood the mock-up model designed by designer using the standard product design process, where users are usually not engaged.

3.5.2 STATEMENT OF RESULTS

The very old people accepted the model with varied reactions. The reason for this was probably that this particular group did not use any modern technology. Therefore, the mock-up model reminded them of items that are not related to technology, for example, children's toys, kitchen utensils, different life experiences and past memories. Furthermore, this group was not able to accept the changing of its visual appearance or the interaction with the device, as neither applied in everyday life. One of the reasons, apart from not employing modern technology (the technological gap), was the non-functionality of the mock-up model. Furthermore, this group was not able to understand how the model interacted; when participants were required to employ the model in certain situations to demonstrate how it could be used, they were not able to do so. This group preferred to follow well-known technology and routine than try something novel (see Table 3).

The most critical reactions came from active older people, perhaps because this group do not perceive themselves as older people. They think of themselves as active and still working individuals, who apply different technologies in everyday practice. However, it is necessary to point out that this group of interviewees were applying various technologies. This might not be the case if the interviewees were different. Therefore, the model reminded them of current technological devices. However, they considered the design of the model and intuitive interactions as naive and old - fashioned. The model's visual appearance reminded them of the Magic Roundabout, and in terms of interaction they expected a more sophisticated interaction; they mentioned products from the Danish company Bang & Olufsen (see Table 3).

Results from the postgraduate students might not be seen as surprising, since the age of the designer who designed the model was almost the same as this group. Therefore, the model's interaction was quite close to this group of participants. Furthermore, the model reminded them of current or of future technologies. This group expected more complex

interaction, although they saw the model as an entertaining device that could help older people in their daily lives (see Table 3).

	The very old people	The active older people	The postgraduate students
1.) Familiarization with the mock/up model			
All three groups did not have any difficulties with recognition of various parts of model.			
i.) Object reminds me of...	a garden, a children's toy, kitchen utensils, daily care items and food, as well as different life experiences in childhood, life situations (generation gap) and past memories	education equipment, cartoon figures, underwater vegetation, a new version of the CD player or a small personal CD or MP3 player or seismograph	Existing (radio, optic fibres, movement sensors, remote control, hanging light, speaker, Tamagotchi) and future technologies (tangible version of the virtual community and "plans", multimedia iPod with sound, smell and photo information
ii.) Materials, shapes, colours, size	too large to keep it on the window shelf or on the table	Child's representation of a garden	more realistic, natural and designed in traditional style to be more appropriate for older people
No participants wanted to possess the device.			
iii.) Imagine / not imagine object blinking, glowing,...	not able to imagine & problems with distinguishing between a real garden, the mock-up model (non-functional) and the interactive (functional) model	able to imagine changing and transforming mock-up with some hesitation	able to recognize mock-up model's interaction
2.) User's opinion (criticism) of the mock-up model			
i.) Participants' interaction with the model	difficulties with accepting the way the model was interacting	understood interaction with the device as old-fashioned and too simple	preferred more complex interaction
ii.) Criticism: negative/positive	/	buttons, a lot of different options and more information	childish, for older people need to be designed in old style & more visual attractive to older population, not able to satisfy all age groups with one design
iii.) Who could be a potential user?	children	other "older" users then themselves, children, and people with disabilities	children, but not teenagers or older people
3.) Adoption of the mock-up model as an interaction device			
i.) Model supports the situation	/	be reminded to take a medicine	make conversation & be reminded
ii.) Model does not supports the situation	/	communication device	managing smart house

Table 3: A summary of findings from Study 1.

3.5.3 UNEXPECTED OUTCOMES

The most unanticipated finding was the very low acceptance of the model among older people in all three areas that were investigated: its visual form, intuitive interaction and adoption in everyday life. This means that the model did not satisfy any of the interviewed groups entirely, especially none of the groups of older people.

3.5.4 RELATIONS WITH PREVIOUS RESEARCH

It is very hard to make a comparison with other existing studies, such as (Kahn et al., 2005; Holstius et al., 2004; Kuribayashi et al., 2007; Jung et al., 2007 and Liang, 2007), because this evaluated future design concept is quite unique. Furthermore, the studies listed are experimental, and they investigate specific relationships between users and plants. However, only the diploma project *Soundgarden*¹⁶ (Wolf, 2002: 7) might be related and compared with the Virtual Garden. '*Soundgarden*' is "*an interactive toy for toddlers, which allows them to manipulate and arrange sound samples through play*" (ibid) and it is the closest in terms of form, function and purpose to the evaluated project. The student who developed '*Soundgarden*' reported some difficulties in evaluating the '*Soundgarden*' prototype with children, since the model was not fully working. However, his results show that a 3-year-old child was able to understand the interaction (plugging gadgets in to a flower patch) and with hints (Wolf, 2002: 36) was able to complete the task; although this child soon found interaction very boring. A 7-year-old child had no problem interacting and understanding it. The author concludes with positive evaluations conducted with only two children, but he suggested evaluations should have taken place with the fully functioning model.

3.5.5 POSSIBLE EXPLANATIONS FOR RESULTS

The most important finding was that the mock-up model designed by designers was not an optimum approach for any group of older users. The preliminary study indicated that both design and the intuitive interaction with the device were not appropriate for older people, although the future design concept was designed predominantly with the aim of satisfying the needs of the older population. Another important finding was that none of the group from the conducted study thought of older people as potential users. The main reason for this was the model's slightly naive and childlike visual appearance. The third very important result, based on very critical comments from working older people, showed that methods employed in the standard design process of mock-up were not the most suitable. For

¹⁶ The entire title of the diploma work is: "*A tangible interface that enables children to record, modify and arrange sound samples in a playful way*" (Wolf, 2002: 36).

example, participants were incompletely engaged in the design process and did not have any direct influence on the design of the interactive device.

3.5.6 COMMENTING ON FINDINGS

The results from the first preliminary study were not very encouraging, especially not for the designer of the design concept. Results led me to think that applied methods were not the most appropriate and the future design concept was not appropriate to be developed further in such a form, especially if this product was to be used by older people. Therefore, it was necessary to think of more appropriate methods that could be applied in the next study.

3.5.7 IMPLICATIONS

This finding had important implications for developing the next preliminary study, as well as the main PhD study. The evidence from this study justified the importance of the active involvement of the older population from the beginning of the design process. Additionally, the results indicated that special attention needed to be given in applying methods suitable for older people.

3.5.8 SUGGESTIONS FOR FUTURE WORK

In the future it might be necessary to think of applying the creative user centred design process along with employing methods where older people would be involved in a more active way. Furthermore, the design process and methods needed to be chosen in a way that would support and stimulate older people in providing their opinion and experience.

3.6 CONCLUSIONS

3.6.1 SIGNIFICANCE OF THE FINDINGS

In general these results are not surprising, as they confirm findings from other researchers (Healy, 2003). However, they were an excellent starting point for the next preliminary study, as well as for the entire PhD study.

3.6.2 RECOMMENDATIONS FOR FURTHER WORK

These findings provided the following insights for the next preliminary study. It was necessary to:

- get more understanding about the lifestyle of the older population

- get more detailed information about older people's relationship with modern technology
- investigate existing approaches, methods and processes applicable to older populations and young designers
- examine aspects that can stimulate or inhibit older people's creative engagement
- determine what issues are necessary to consider in engaging older people and designers in the creative user-centred design process.

3.7 RESEARCH QUESTIONS WITH OBJECTIVES AND HYPOTHESIS

Based on the first preliminary study the two research questions, each with several objectives, and a hypothesis were established. The research questions are presented below in relation to three studies described in the following chapters:

3.7.1 STUDY 2: OBSERVING OLDER PEOPLE AND YOUNG DESIGNERS

To respond to the first research question:

RQ 1 WHAT STIMULATES OR INHIBITS CREATIVITY IN OLDER PEOPLE IN COMPARISON WITH DESIGNERS?

the second preliminary study was then conducted. This study required three different observations of the following: i.) the very old people (from 70 to 90 and over); ii.) the active older people (from 55 to 69 years); and iii.) the postgraduate students (from 25 to 28 years). In addition, this research question had the following four objectives:

OB 1 To explore participants' experiences with technology

OB 2 To investigate existing approaches and processes adopted by older people and designers

OB 3 To identify factors that stimulate or inhibit creativity during the design process

OB 4 To observe practical implications in order to facilitate creative engagement

Special attention was given to the health conditions of the older people and how this might affect their motivation and engagement in future studies.

3.7.2 PILOT STUDY: TESTING THE PROPOSED CREATIVE DESIGN PROCESS

The above pilot study was conducted which tried to achieve the following two objectives:

OB 1 To test the proposed content of the methods that engage subject in the main study, and to test:

- a.) Procedure for analysing data for the main study
- b.) Recording of data settings

OB 2 To test the procedure for analysing data in the main study

Under this objective the following areas were investigated:

- a.) The most appropriate method for assessing qualitative data during the creative process
- b.) Identifying potential phenomena that will be assessed during the creative process
- c.) The most appropriate approach to assessing the final output

3.7.3 STUDY 3: INVOLVING OLDER PEOPLE IN THE CREATIVE DESIGN OF DIGITAL DEVICES

After completing the first and second preliminary studies and literature review, a series of different methods (traditional, experimental and alternative) were employed within the creative design process and subsequently studied. The results from the first and second preliminary studies led towards the main study, which addresses the second research question:

RQ 2 CAN OLDER PEOPLE BE INVOLVED AS EQUAL PARTNERS IN A CREATIVE UCD PROCESS FOR DEVELOPING DIGITAL DEVICES?

The main study required three creative workshops that used the same creative methods with three different sets of people: designers, a mixed group (active older people and designers), and active older people. The preliminary results from the pilot study indicated that the mixed groups, consisting of older people, who could draw on their considerable experience, alongside designers, who were familiar with the newest technology, might create suitable and appropriate products for the older population. These results lead to the following hypothesis:

H A CREATIVE USER-CENTRED DESIGN PROCESS CONDUCTED WITH MIXED GROUPS (OLDER PEOPLE AND DESIGNERS) IS MORE APPROPRIATE FOR DESIGNING BETTER PRODUCTS FOR OLDER PEOPLE THAN CONDUCTING THE SAME PROCESS WITH EITHER DESIGNERS OR OLDER PEOPLE ALONE.

4 STUDY 2: OBSERVING OLDER PEOPLE AND YOUNG DESIGNERS

4.1 INTRODUCTION

The main purpose of this chapter is to observe three different processes: i.) the creative engagement of the very old people, ii.) the learning process of the active older people, and iii.) the design process of the young designers. During these observations older people's and the young designers' experiences with technology were closely explored. Secondly, existing approaches and processes applied by those two groups were investigated. Also, factors that stimulate or inhibit creativity during the design process were identified. Finally, practical implications for adequately facilitating the future creative engagement of the observed groups were recorded.

This chapter discusses this second preliminary study and is divided into three independent sections (where results from observations conducted with three different sets of people are presented):

a.) The very old people (VOP) at the Vintage Club

The rationale for this club is to bring together very old people (75+ years) in the Muswell Hill area for the purpose of social interaction and entertainment. The creative engagement of club members was observed at these observations.

b.) The active older people (AOP) at the Hackney Silver Surfers (HSS) Centre

This is a day centre (founded by Age Concern) where people older than 55 years can seek help and basic knowledge with a computer¹⁷. They can also check their emails or talk to their peers and exchange information. The learning process during the basic computer course was observed.

c.) The postgraduate students (PGS) at the Human Centred System module

The students (in their middle twenties) from the City University London were attending the MSc Inclusive Design module. Postgraduates were observed during the design process, when they were designing an information device for disabled people for the London Olympic Games in 2012.

¹⁷ In addition, they can get some advice on use of mobile phones, digital cameras, Internet and software (for example, Microsoft Office). The Centre organizes some outside afternoon activities.

In each of the independent sections, applied methods, design, participants' participation in the study, used apparatus and materials, and procedure will be described. In the last part of each section, results with discussion, conclusion and summary will be presented. At the end of this chapter a discussion and a conclusions section will be presented to bring together the findings from the three separate studies.

4.1.1 BACKGROUND AND MOTIVATION FOR THE STUDY

The first preliminary study reached the following conclusions relating to the interaction of the future design concept with three different age groups:

- **The very old people from the Vintage Club** had the most difficulties intuitively interacting with the device and its changing visual appearance. In addition, they were not able to employ the model in any of the required situations, as they preferred to use familiar technology and routines.
- **The active older people from the Guy Chester Centre** found interaction with the device too simplistic and traditional and they preferred using ways of communication "buttons" and multiple options. However, they were able to adopt the model as a reminder in their daily routine.
- **The postgraduate students** thoroughly adapted to the design concept, regarding the model as an intelligent toy. They did not have any problems understanding how they might interact with the model, stating that they would prefer more complex interactions.

In Study 2, the reactions and opinions of the three groups will be studied further.

4.1.2 AIMS AND OBJECTIVES

There are no papers that report on observations of the three different age groups and mutual comparison. Furthermore, there have been no studies carried out on understanding older people from the perspective of their participation in the group's creative activities.

In this study the factors that stimulate and inhibit creativity in the older population will be investigated. This study will observe the creative engagement, learning and design process with three different ages of participants. The study has four main objectives and eight aims:

1.) To explore participants' experiences with technology

The main aim was to get more information about experiences with technology of the observed groups. Of special interest were the information technologies (such as a computer, Internet and different software) that the older people and designers used in their daily routines.

2.) To investigate existing approaches and processes adopted by older people and designers

In order to improve the interaction of older people and designers in the creative process the following questions were considered: what are the existing approaches? What are the processes and methods that are currently applied by older people and designers in the creative engagement? What are the technologies that designers utilize during the learning and creative process? Five research phenomena were observed under this objective:

a.) Participants' motivation to participate in an activity (VOP + AOP)¹⁸

The main focus was to gain more understanding about what motivates older people to participate in various learning activities, for example, learning how to use a computer.

b.) Engagement in group's activities and group dynamics (VOP + AOP + PGS)

The older people's participation in group activities and any alternative approaches were investigated at this point. In addition, group dynamics during the design process were closely observed.

c.) Applied approaches and methods (VOP + PGS)

Strategies used by the facilitator to engage very old people in participation were studied, including approaches to presenting and engaging the group with study material. Finally, methods that the postgraduate students used in their design processes were observed.

d.) Applied processes (AOP + PGS)

The main focus here was the design processes that postgraduate students applied, and whether this or similar processes can be employed in the intended future study.

e.) Applied technologies during the process (VOP + AOP+ PGS)

Technologies that were used by both groups of older people and young designers were studied in order to get some idea what technology (if any) could be applied during the planned creative engagement.

¹⁸ Letters in brackets mark which groups were observed for certain research phenomena.

3.) To identify those factors which stimulate or inhibit creativity during the design process

This study also answers the first research question:

RQ 1

WHAT STIMULATES OR INHIBITS CREATIVITY OF OLDER PEOPLE IN COMPARISON WITH DESIGNERS?

Observations that could trigger and stimulate creativity of the older population and young designers were monitored in order to propose the most appropriate creative methods for the main PhD study. In order to answer the questions, the following definitions of stimulating or inhibiting factors were established:

- a.) Factors that stimulate creativity** are aspects that trigger creativity of individuals or groups during the creative process (see section 2.2.4.2).
- b.) Factors that inhibit creativity** are aspects that appear to prevent or make it harder for individuals or groups to show creativity, for example, health issues of the older population (see section 2.2.4.3). Special attention was given to the health conditions of the older people and how this affected their motivation and engagement in future studies (see section 2.3.5.15).

4.) To observe the practical implications for facilitating creative engagement

In order to involve older people and designers in a group to facilitate creative engagement, it was firstly necessary to investigate what practical implications needed to be considered when organising creative activities.

a.) Practical implications (VOP + AOP + PGS)

Factors that might disturb participants were the importance of space, an unfamiliar facilitator and the length of the activities. These findings were crucial for developing a sound plan for creative engagement.

A description of the results will follow the four research objectives.

4.1.3 THE TIMELINE OF CONDUCTED STUDIES

The first observations started after conducting Study 1. All observations lasted differing periods of time and were done at different points during the week:

- a.) **The very old people at the Vintage Club** were observed from March to July 2007 and from December 2007 to March 2008, at regular consecutive fortnightly meetings.
- b.) **The active older people from the Hackney Silver Surfers centre** were observed over 3 months, from October to December 2008.
- c.) **The postgraduate Human Centred System students** (future designers) were observed over 4 months, from February to May 2008 at standard weekly meetings; however, their meetings were more frequent at the end of the creative process (see Figure 14).

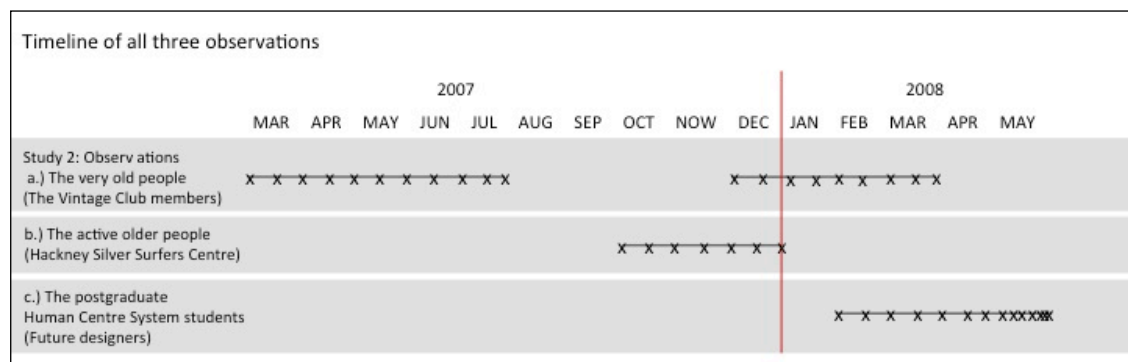


Figure 14: Timetable for Study 2. Three different observations were done in Study 2.

4.2 THE VERY OLD PEOPLE

4.2.1 INTRODUCTION

After conducting Study 1, there was a great amount of uncertainty regarding the inclusion of this group in further studies or not. Therefore, the rationale for this section was to gain more understanding of and consideration for the very old people involved in creative engagement. However, the following areas were explored in more detail: experiences with technology, existing approaches and applied processes, factors which stimulate or inhibit creativity at the point of creative engagement, and practical implications. Creative stimuli and original approaches used with this group were studied more specifically.

As the first personal contacts with the Vintage Club members had already been established and there was an opportunity to conduct further activities, it was decided to continue with observations of this particular group. The aims for these observations followed the already established plan for the entire Study 2.

This chapter will firstly describe the method, design of the study and description of the area from which participants were recruited. The participants, applied materials, the procedure for the study will all be described, before finally discussing the results. The results are delivered under the same structure as the established aims for Study 2. The chapter ends with a discussion, a conclusion and a summary.

4.2.2 METHOD

The field studies method of observations (Sharp et al., 2002:6) was applied in order to get more understanding and valid information concerning the very old people. As a few members of the Vintage Club had been included in Study 1, the facilitator of the club agreed to the additional observations. This opportunity was an excellent start for the study. A large amount of time and effort was spent on observing this particular group. In addition, I helped in the kitchen, serving tea and cakes. I also prepared a presentation at one of the club meetings and visited one of the members at independent home for older people.

4.2.2.1 DESIGN

Observations were done in the Residents' Lounge at the Paddock in the Vintage Club, Muswell Hill. The club was part of the community programme of the Muswell Hill Methodist Church. The observations were carried out in a renovated Victorian villa attached to the

Methodist Church (see Figure 15), which was within walking distance of the residential complex and care home for older people. Observations started only 14 days after the first preliminary study was conducted and were held from March to July 2007 and from December 2007 to March 2008 (see Figure 14). Each series of events lasted three months and usually contained six talks (presentations from various invented speakers) and one special Seasonal meeting. In all, 12 meetings and one 'Seasonal Special' were observed, and one club member was visited. The aim was to attend as many meetings as possible in order to maintain long-standing personal contacts with the Vintage Club members. Regular meetings were on Thursdays each second week, between 2.30 to 4.00 pm. The meetings normally had two parts. In the first part invited speakers made a presentation that lasted between 45 minutes to one hour, then was followed by a short time for questions. The second part involved a 30-minute informal social meeting, followed by tea, where members were able to socialise. In addition, several quarterly Saturday Seasonal Specials took place with activities that involved a variety of quizzes, book readings and memory games with the usual teatime at the end; however, only one was observed.



Figure 15: The entertainment events for the very old people were held in a renovated Victorian Villa.

At this point it may be useful to describe the area from which the participants were recruited. Muswell Hill is a fairly prosperous and peaceful suburb of London with good schools, family-sized houses, gardens and green spaces. Being family-oriented, Muswell Hill has a strong community spirit (Muswell Hill Business Online, 2002).

4.2.2.2 PARTICIPANTS

The age of the Vintage Club members was from 70 upwards. Participants were mostly female, although three to four males attended as well, depending on the topic. On average, from 15 to 20 people attended each session, most on a regular basis. The majority of the older people came either from independent dwelling units or from the surrounding Muswell Hill area.

4.2.2.3 APPARATUS AND MATERIALS

Throughout the observations, written notes were made and a digital camera was used to take photos. A dictaphone was not used as it was thought not to be appropriate for recording informal conversations with club members. Short notes and reports were later transcribed into electronic form. Ethical approval for the observations was covered under the application for the entire PhD study.

4.2.2.4 PROCEDURE

Before the actual event started I usually helped to prepare food in the kitchen for the social part of the meeting. This time was very important for establishing personal relationships with members of the club, to obtain some news about them, to find out about future activities that they were preparing for, as well as to get some ideas about how older people live. When the presentation began I joined club members in the '*Garden room*' and started to observe their reactions, such as their interest and engagement in the presentation, and their participation in the question time at the end. During the observations various notes were made. For the duration of the informal part of the meetings I helped with serving food and talked to participants to gain some more data.



Figure 16: The very old people and the use of technology. The participants attend the presentations where the facilitator and presenters but not the older people themselves used modern technology.

4.2.3 RESULTS

The results are explained under four sections, which followed the research aims:

- **Experiences with information technology**
- **Existing approaches and processes**
- **Factors that stimulate or inhibit creativity**
- **Practical implications**

In some sections, results are illustrated with practical examples from the observations.

4.2.3.1 EXPERIENCES WITH INFORMATION TECHNOLOGY

From personal conversation with the participants it was noted that nobody in the observed group had used a computer or any other IT applications in their daily lives, and only a few people had ever used a mobile phone. Furthermore, from the talk it was evident that they did not have a great desire to learn how to use new applications. For example, when asked if they would use a computer they replied: *"Yes, once we need to start to use it."* In the case where they had to use it, they reported that they asked for assistance from their younger relatives.

4.2.3.2 EXISTING APPROACHES AND PROCESSES

The following points were noted.

a.) Participant's motivation to participate in an activity

Three factors were identified during observations that motivated participants to attend the Vintage Club meetings:

- Social interaction with peers

In my opinion, the opportunity for social interaction was the main reason why participants visited the club, as they truly enjoyed the informal teatime part of the event. During this time they sat around the tables to have tea and cakes, and talked to each other to catch up with the local news, events or maybe discuss the presentation. They also talked to the presenter, had a look at the presenters' additional material, and so on.

- To gain new knowledge

Participants were interested in meeting a new person (the presenter) and experience something interesting.

- To be involved in the event (to be still needed)

Usually members of the club came one hour earlier to help in the kitchen preparing for teatime. Then they helped to serve tea and cakes, and tidied up the room and kitchen at the end of the meeting. They also assisted in the transport of those with physical difficulties.

b.) Engagement in the group's activities and group dynamics

The participants preferred inactive engagement during the presentations such as observing, listening, applauding, asking questions and sometimes singing. After the presentation, participants asked interesting questions or talked to the presenter. To illustrate this, on one occasion I held a presentation about Slovenia and life in the former Yugoslavia. After the talk I was asked the following questions:

- *Was I planning to go back to Slovenia after my study and use my experience from Great Britain?*
- *What did younger people think about the separation from the former Yugoslavia?*
- *Why are English people buying properties in Slovenia?*
- *Who were Tito's parents?*
- *Which region in Slovenia did I come from?*

After the presentation, a female person showed me photos from her trip in Slovenia, which she made in the 1960s. Another member mentioned her memories from a trip to Dubrovnik and Korčula. Afterwards, a retired history teacher wanted to have a more detailed discussion with me on the history of the Socialist Federal Republic of Yugoslavia. Another

person had a discussion with me about her difficulties with mobile phones. At the end, many of them came to me to express their thanks and appreciation for the talk.

c.) Applied approaches and methods

At the presentations, speakers utilized various approaches to presenting their content. For example, a science teacher used a Power Point presentation to present visual material and various devices e.g. a microwave, and materials to demonstrate his experiments. Participants enjoyed his presentation very much, and afterwards asked him various questions relating to school policy. Then, at the Special session event, a retired couple (one a former primary teacher) recorded different voices on an old Dictaphone and played them to participants. Below are two examples, which illustrate how presenters applied different and quite innovative approaches:

Example 1

The primary science teacher, who taught physics at primary school, demonstrated several different experiments, which he usually presented to pupils with the aim of bringing science closer to them. For example, to explain how microwaves work, he used a chocolate bar that he melted for different amounts of time in a microwave (he did the same with fried eggs). Then he used a plastic spiral (slinky) to demonstrate how radio and microwaves make a journey from point A to point B.

Example 2

The retired couple recorded various sounds (e.g. crushing of cellophane, whisk, flute, water dripping, metronome, microwave, toilet splash, alarm clock) and played them to members, and then participants had to guess what the recorded sounds were. Members did not have any difficulties in recognising all the recorded sounds.

d.) Applied technologies during the process

At the presentations various technologies were applied, for example, Power Point was used in delivering presentations. The facilitator mainly used a laptop and a projector for facilitation purposes. Audio material was delivered by the use of an old dictaphone, cassette player and radio. A TV and DVD player was used to play video material (see Figure 16).

4.2.3.3 FACTORS THAT STIMULATE OR INHIBIT CREATIVITY

a.) Factors that stimulate creativity

The following two factors stimulated creativity in the observed group:

- **Creative stimulus**

The creative stimuli were rather simple for this group, for example, poems, a song, a proverb, a photo, and a postcard for the name of a certain place. An example of this was observed when the presentation about Slovenia and life in the former Yugoslavia was given. The presentation triggered a lot of questions and memories of places that members had visited as tourists. Later, the group facilitator remarked to me that this was one of the best presentations of the year. The second example was when a priest presented his life story over a selection of songs. Those songs triggered members' memories as they started to sing, expressing their own memories of a particular song, or they started moving in rhythm or clapping along to the song. These two examples are presented in more detail below:

Example 1

Employing the creative trigger of playing an old partisan song to participants stimulated participants' attention. Then I presented a Power Point presentation while dressed in the uniform of Tito's youth monument. Furthermore, some visual material and items from Slovenia and the former Yugoslavia were shown, and finally, a short quiz with rewards at the end of the presentation was delivered.

Example 2

On one occasion the priest presented his life story through the songs that were symbolically related to his life. Each song was related to certain parts of his life story; for example, The Edwin Hawkins Singers' song "O Happy Day" was related to his childhood memories, when he was a member of a band named "The Young Beatles". Then the song "Hey Mister Tambourine man" by Bob Dylan reminded him of his dead brother. At the end he played a song with the title 'First House then Home' on his brother's guitar. Altogether he presented 7 different songs.

Members directed me to a lady who was still very creative despite her age. I arranged to visit her and recorded her story as an example of a creative person at a very old age (see next page, Figure 17).

- **Experienced facilitator**

An experienced volunteer, who had worked at the club since 2000, facilitated the Vintage Club. The facilitator was in her sixties and therefore closer to this older population. Also, she was very sensible and she understood members' needs (for example, she helped organise the transport of club members, but did not compromise their need for privacy), and she was very respectful towards members of the club. Additionally, she was very innovative in

providing presentations, topics and appropriate speakers. The facilitator spent a lot of extra time and energy in organizing meetings and special events.

Annette, 85 years

Annette¹⁹ has collected postcards and has kept a scrapbook since primary school. Her collection of postcards was carefully organized into groups: winter topics, St. George's day, cards for special occasions and so on. She has written a diary of the Paddock (the place where she lived in Muswell Hill) where she describes daily activities, special events, (for example, a flower exhibition), weather reports, residents' birthdays, anniversaries and so on. She even noted small things that happened around her flat: for example, when flowerpots were replaced by recycling bins. She has also made a patchwork of her life where she has graphically represented schools where she was studying, counties where she has lived, the numbers of houses where she has lived, her family tree, activities in church, her pen friends, trips around the world, her hobbies and so on. She was already retired before computers appeared and therefore she has never used them. If she needs to look for certain information, for example, about certain illnesses on the Internet, she asks her nephew.



Figure 17: Memorabilia from a very old participant: Annette's scrapbook from 1935 and her collection of old postcards.

- Interesting content presented to the observed group

Some interesting and varied talks were presented at the Vintage Club meetings. The presentation topics varied, from travel experiences (for example travel to foreign countries, pilgrimages), science teaching practice at a primary school, hobbies (evening class painting) and life stories. On Saturdays, the "Seasonal Specials" participants discussed English literary history, poetry, famous Englishmen, proverbs, modern fabric developments (such as nylon) or devices, for example, landline phones.

¹⁹ The original participant's name was changed.

b.) Factors that inhibit creativity

Observations indicated two factors that inhibited creativity in this group:

- **Poor health condition**

It was apparent that most of the participants had a poor health condition, which might affect their creative engagement. Most of these health problems were simply a consequence of the ageing process. Participants had difficulties with mobility, necessitating the use of wheelchairs or walking sticks. Several members suffered from visual and hearing impairments; for example, one member was almost entirely blind, and one lady complained that she was not able to hear if the room became too noisy. However, none showed signs of dementia (see section 2.3.5.15).

- **Lack of concentration**

Some of the participants had difficulty in concentrating on the presentations; for example, they fell asleep or became lost in their own thoughts.

4.2.3.4 PRACTICAL IMPLICATIONS

During the study the following results were indicated, which should be born in mind if this group is to be involved in the future studies:

- **Familiar environment:** Events need to be held in a place which is familiar to participants and is easily accessible.
- **Facilitator's role:** This is very important, since participants need to be familiar with and have confidence in the facilitator.
- **Length of activities:** Activities with this group should be kept short (from one to two hours).
- **Delivering content:** Special attention needs to be paid when talking to or presenting information to the group, because of hearing and visual impairments. Therefore, it is necessary to use a full-sized screen for projection and loudspeakers.

4.2.4 DISCUSSION

4.2.4.1 STATEMENT OF RESULTS

This observation investigated the creative engagement of a group of very old people at the Vintage Club in Muswell Hill, London. Apart from the overall aims creative stimuli, innovative approaches applied by speakers, and creative individuals in the club were observed. Results are presented under the four research aims below:

a.) Experiences with information technology

A low employment of the newest technology was indicated for this group of very old people; no members were using a computer or the Internet, and only a few possessed mobile phones. In addition, they did not have any desire to be taught how to use this technology. Participants relied on the help of their younger relatives when they needed to use any new technology.

b.) Existing approaches and processes

The club members were motivated to participate in events for four main reasons: social interaction with their peers (the tea time at the end of the presentation), to meet new people, to gain additional knowledge, and to be actively involved in the event, i.e. to be still helpful. Furthermore, these participants preferred passive engagement (observing, listening, questioning) rather than active involvement; however, some members were willing to present their life stories in addition to their group activities. Speakers were very innovative in delivering various subjects. These innovative approaches were particularly applied during the Special sessions e.g. recorded voices on an old dictaphone. Various pieces of equipment such as a laptop, projector, TV, dictaphone and a cassette player were all used in the presentations.

c.) Factors that stimulate or inhibit creativity

The two main factors that stimulated creativity for this group were simple creative stimuli and interesting content. The creative stimuli, such as a poem, a song, proverb or postcard stirred memories or important life experiences. Secondly, the interesting content of the presentations (which was specially adjusted to the observed group) motivated participants to attend reasonably regularly.

The two main factors that inhibited creativity were the poor health of some members and lack of concentration. Severe health problems and decline of senses, such as mobility difficulties, visual and hearing impairment and lack of concentration (falling asleep during the presentation) were a consequence of the ageing process.

d.) Practical implications

Based on observations, the following implications need to be considered in order to engage this group in creative events (see Table 4).

Practical implications	The very old people
Familiar and easily-accessible environment	Events need to be held in a place which is familiar and easily accessible to participants
Facilitator's role	Participants need to be familiar with the facilitator
Length of activities	Activities with this group need to be short (from one to a maximum of two hours).
Delivering content (hearing and visual impairment)	A full-size screen for projection and loudspeakers needs to be employed

Table 4: Practical implications for the very old people.

4.2.4.2 UNEXPECTED OUTCOMES

Through the study two interesting points were indicated relating to health issues and technology adaptation. First, there was a great interest in and reasonably regularly attendance at the events, with passive rather than active engagement, and some of the participants had a poor health condition that inhibited their creative potential. At times some participants were not able to attend events for health reasons e.g. an operation, or a long stay in hospital. Second, the group was surrounded with information technology but, they did not show any interest in learning about it.

4.2.4.3 POSSIBLE EXPLANATIONS FOR RESULTS

A possible explanation for this result is that some of the very old participants (from 70 to 90+ years) used walking sticks or were in wheelchairs. An explanation for their preference for passive engagement could be that they were not willing to draw attention to themselves to peers or they were not used to addressing an audience. It is perhaps important to note that many within the group were most likely retired before computers were introduced to the workplace.

4.2.4.4 COMMENT ON FINDINGS

The overall results were rather disappointing as they indicated that it would be very difficult to engage this cohort in the creative design process because of health problems and their lack of experience with new technology.

Consequently an entirely different approach and applied methods will be required to engage this group of people the creative design process. Another more extensive study is required that will need to focus specifically on this group of people.

4.2.4.5 IMPLICATIONS: PROPOSED METHODS

These findings of this study had a number of important implications for planning the main PhD study. Based on the results of this study, this group of participants would be very difficult to involve in the group engagement for the two reasons outlined above. However, if this group was to be involved in a further study, proposed activities would have to be short in length and relevant to the nature of this particular population and to their interests. Therefore, the following methods needed to be employed:

- simple activities like games, that can stimulate peoples' memories
- participants not being publicly exposed unless if they wish to
- activities which engage the entire group
- a more individual approach as an alternative to group activities
- more informal and sociable activities, with refreshments available.

4.2.4.6 SUGGESTIONS FOR FUTURE WORK

A separate study, fully investigating the group's engagement in the creative process and their creative potential, should be undertaken.

4.2.5 CONCLUSION

4.2.5.1 SUMMARY OF CONTENT

The creative engagement of the Vintage Club members in Muswell Hill was observed in this section. During the observations of creative engagement, four different areas were investigated: participants' experiences with technology, applied processes and approaches, factors that stimulate or inhibit creativity, and practical implications. Special interest was given to creative stimuli and the presentational strategies that speakers applied. Results were then delivered under the listed aims and they concluded with a discussion, a conclusion and a summary.

4.2.5.2 SUMMARY OF FINDINGS

The findings revealed that the group did not have any experience with the latest technology and had very little desire to employ it in their lives. Social interaction with their peers, meeting new people, learning something new and being actively involved in the event were

identified as the main motivational factors. Additionally, this group preferred passive rather active engagement, apart from some rare individuals who prepared their own presentations. The presenters utilized various approaches to delivering their story; in addition, diverse technologies were applied during the presentations. Next, uncomplicated stimuli and interesting topics were identified as very important factors if the group is to be engaged in the creative process. Finally, two significant factors that inhibit creativity, poor health and lack of concentration, were identified.

4.2.5.3 SIGNIFICANCE OF THE FINDINGS

It is very hard to evaluate the collected results since the study was undertaken with a very small sample. However, these observations were important to justify the decision as to whether to involve this particular group in creative engagement or not.

4.2.5.4 RECOMMENDATIONS FOR FURTHER WORK

These findings will provide the following insights for the observations of the active older people:

- investigate the use of technology by the active older population
- look into the possible creative engagement, method and processes within this group
- identify practical constraints that need special attention
- identify technology that could be applied during the design process.

4.2.6 SUMMARY

Table 5 lists the findings from this section:

Findings	The very old people
1.) Experiences with technology	
	Nobody in the observed group used a computer or any other IT applications (some members used mobile phones).
2.) Existing approaches and processes	
a.) Participants' motivation to participate in the activity	i.) social interaction with peers ii.) to gain new knowledge iii.) to be involved in the event (to be still needed)
b.) Engagement in a group's activities and group dynamics	Preferred passive engagement at the presentations (observing, listening, applauding, asking questions).
c.) Applied approaches and methods	Utilized various approaches to presenting content (PP, music, kitchen applications, old dictaphone).
d.) Applied processes	N/A
e.) Applied technologies during the process	Traditional audio material (radio, old dictaphone, old cassette player) and video material (TV or DVD player, projector).
3.) Factors that stimulate/ inhibit creativity	
a.) Factors that stimulate creativity	i.) Creative stimulus (a poem, song, proverb, photo, postcard, name of certain place or something that can relate to their life experiences or that encourage their memories) ii.) Experienced facilitator iii.) Interesting content adopted for observed group (travel to foreign countries, pilgrimages, teaching practice in primary school science, hobbies (painting at evening class) and life stories
b.) Factors that inhibit creativity	i.) Severe health problems (mobility difficulties, visual and hearing impairment) ii.) Lack of concentration
4.) Practical implications	
	i.) Environment should be familiar to participants and easily accessible ii.) Facilitator's role is greatly important (participants need to be familiar with facilitator) iii.) Length of activities should be reasonably short iv.) Delivering content: A special attention to delivering information

Table 5: The summary of the very old people section.

4.3 THE ACTIVE OLDER PEOPLE

4.3.1 INTRODUCTION

The main aim of this section is to gain more perspective on active older people and their interactions with computers, existing approaches, factors that stimulate or inhibit creativity and practical implications. Additionally, practical constraints need to be identified and considered if the group is to be successfully involved in future studies. Also, as with the previous group, it was crucial to establish a long-lasting relationship in order to continue working with them.

From the beginning of this study, contact was established with the Hackney Silver Surfers Centre (HSSC), where the Centre for Human Computer Interaction Design (City University London) had conducted several studies in the past. The HSSC was within easy travelling distance of the University, an important factor if this group was to be involved in further studies. Observations followed the established aims for the whole of Study 2. However, special attention was paid to participants' experiences with technology, the way teachers delivered study material and to the practical constraints that were necessary to acknowledge when working with this age group.

In this section the method and design of the study will firstly be explained. Then details about participants, where they came from, teaching materials and the procedure for the observations will be given, followed by the results at the end. Results are delivered under the same headings as the established aims for the second preliminary study. At the end of this section a discussion, a conclusion and a summary is presented.



Figure 18: The HSSC: a member of the centre working as a receptionist and some of the computer equipment.

4.3.2 METHOD

The observations method was applied in order to get information on this particular group of users. The members of the Age concern centre were observed during a basic computer skills course.

4.3.2.1 DESIGN

Observations were performed at HSSC, which provided complimentary computer training support and Internet access for people over 55 years of age who live in Hackney (London) (Age Concern Hackney, 2007). The course “*Internet for Mid-Lifers*” focused on the use of Internet resources to improve older people’s lives in various ways, particularly with respect to health information, services, and social inclusion. Participants would then be able to use the Internet for older social networking, Internet dating, putting personal photos on the Internet and so on (Age Concern Hackney, 2007). In addition, special workshops were organised for such topics as employability and interview skills. However, the overall aim of the Centre at the present time is to introduce the Internet to as many people as possible within the area.

The *Word-processing with MS Word, World-Wide Web and Email* course was observed, which ran each Monday from the beginning of November until the middle of December 2007, from 10.30 am to 2.30 pm. During the course participants were taught basic computer knowledge in order to use MS Word (for example copying/deleting files), the use of the Internet, and so on. Classes took place in a small room with single computer tables (see

Figure 18 right). The space was not ideal for running the courses, as it adjoined the centre's communal places (drop in centre, office, kitchen and toilets). People passed the smart board area in order to get access to the toilets or to the kitchen (see Figure 19). Some participants found this to be a distraction.

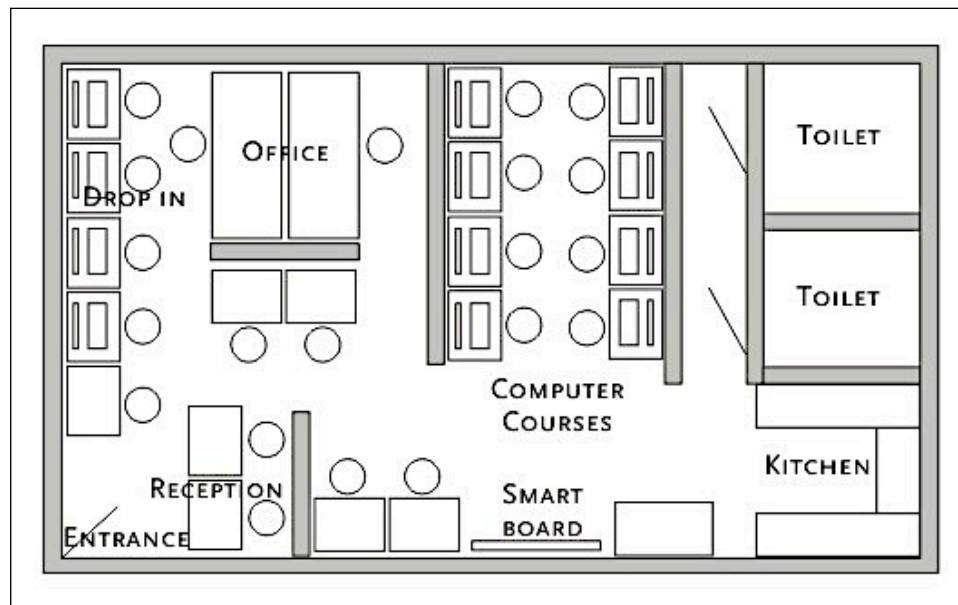


Figure 19: Space in the HSSC: the arrangements in HSSC.

It is important to note that HSS had a very enthusiastic and highly motivated manager. He was formerly a researcher and aware of the importance of the inclusion of older people in research; he therefore encouraged members to participate in various studies.

From the ethical point of view the study was covered by the main application to the Ethical committee.

4.3.2.2 PARTICIPANTS

The group consisted of between 4 to 7 members who varied in age between 60 and 80+ years. The group was very diverse in terms of personalities, abilities and skills, interests, education, motivation, knowledge and health. Indian, English, and African nationalities were all present within the group (see Figure 20). Members of the club called themselves '*Recycled teenagers*' and it was evident from the beginning that they preferred to be regarded as middle-aged rather than older or elderly people.

It is important at this point to describe the area in which the centre was based, as it may have some bearing on the results of the study. From a cultural perspective Hackney is extremely diverse, and has attracted immigrants from all over the world. There has been a Jewish community in Hackney since it developed into a suburb in the 19th Century. Afro-Caribbean and Asian communities were established in the 1950s and 1960s, and Turkish, Vietnamese and West African communities have since joined these. These communities are successfully living alongside each other (London Borough of Hackney, 2008).

4.3.2.3 APPARATUS AND MATERIALS

During the observations, written notes were made using a pen and paper; a digital camera was used for taking photos.

4.3.2.4 PROCEDURE

Several visits were made in order to become familiar with the members of the HSS, and to build personal relationships before observations started. First, I had some short informal conversations with centre members in order to keep informed about events and news. Then, when the course began, I accompanied them and started by taking notes. Sometimes I helped participants to complete their tasks or assisted them in completing course work sheets. During breaks I tried to find out about their lifestyles and experiences. I also wanted to identify potential participants for the future studies. After the observations my notes were transcribed into electronic form and incorporated into a short report.

4.3.3 RESULTS

Results are explained under the following headings:

- **Experiences with information technology**
- **Existing approaches and processes**
- **Factors that stimulate or inhibit creativity**
- **Practical implications.**

4.3.3.1 EXPERIENCES WITH INFORMATION TECHNOLOGY

Observed participants did not have any extensive experience with computers, their skills varied, and they had their “own” way of doing things. None of those observed had ever used computers before because of the nature of their work; one man, for example, had been an underground train driver. Another participant had lost his job because he was not IT literate, and another was afraid to use a computer in case he broke it. One person was familiar with databases but not with other programmes.

4.3.3.2 EXISTING APPROACHES AND PROCESSES

a.) Motivation for participating in the activities

Motivation for attending the course varied from the satisfaction of successfully completing a task, to the need to learn how to use a computer or the desire to learn something new. Participants who attempted to learn the use of the Internet wanted to be closer to their family members, enjoy their leisure time more, learn something important and new, increase their social interaction with peers (be part of a group), and needed and wished to be included in the IT society. Below are two examples that explain participants' motivation to participate in the course:

Example 1

Ann (72 years old): She was visiting the centre before the course to practice using a mouse, but now she is a student on the course. Then her son bought her a computer; she wants to send an e-mail to her second son, who is living abroad.

Example 2

Evelyn (55 years old): One day she passed the Hackney Silver Surfers Centre and decided to become a member. First she participated on a basic computer course, now she has her own web site and is regularly working as a receptionist in the centre.

Another motivation was successfully completing a task, especially when the participant was the first in the group to do it. This factor was very much related to the participants' personal qualities. All course members were very positive with many life experiences, and they had a great sense of humour. Furthermore, they were tolerant and knew why they were on the course and what they wanted to get out of it. They were very determined to learn as much as possible and were interested in the content.



Figure 20: Education in the HSSC: active older people attending the basic *Word-processing with MS Word, World-Wide Web and Email* computer course.

Emily, 83 years

She was determined to learn how to use a computer because she wanted to communicate with her daughter in France. She also wanted to use online-shopping, since the products on-line are cheaper, and to write grammatically correct letters. She intended to make use of a computer on her own, and not to rely on her relatives. She desired to be independent and acquainted with the newest technology. She expressed her determination with the following words:



“If I want to do it, I will, if I can’t, I just will not ... If you want to learn, you will, otherwise you won’t.”

b.) Engagement in group's activities and group dynamics

The participants liked to discuss issues with each other and they, especially the women, enjoyed assisting the less advanced members (peer support). The participants also enjoyed being actively involved in the learning process (for example, asking questions, illustrating a point with their experiences or story) and they were interested in new challenges. The IT teacher was experienced and in his mid sixties, quite near some of the participants' ages, and therefore familiar with their needs. He was tolerant, respectful, willing to explain complicated issues, repeated particular tasks several times and was willing to spend more time with the less capable participants (see Figure 21 left).

c.) Applied process

The teaching style for learning process was adapted to take into account the special learning needs of the group. For example, the teacher reviewed material from the previous lesson each time; the speed of delivery of the content was slowed down, and new topics repeated several times during the lecture. All study material was delivered to the participants in oral and written form. Unfortunately, notes were not printed in large print, and consequently some participants had problems with reading. Also, the teacher used a smart board during the learning process.

d.) Applied technology during the process

The ordinary and assistive computer equipment made the teaching and learning process easier. The HSS Centre used assistive technologies (for example, touch-screen monitors, keyboards with larger keys, (see Figure 21, right) beside common applications (for example, PCs, and a smart board). The participants used accessibility interfaces with full-size icons. The teacher also used at teaching process smart board (SMART Board 600i Interactive Whiteboard System). This approach helped the teacher to explain and display tasks to participants and allowed them to follow instructions more easily.



Figure 21: Use of technology in the HSSC. In the HSSC Smartboards are being used for teaching purposes (left) and for learning assistive and common IT technology (right).

4.3.3.3 FACTORS THAT STIMULATE OR INHIBIT CREATIVITY

a.) Factors that stimulate creativity

No additional factors were indicated, apart from personal motivation which particularly stimulated creativity in this group. The reason for this might be that the group was involved in a learning process and not an especially creative one.

b.) Factors that inhibit creativity

However, three factors were identified which inhibited the creativity of the observed group:

- Slower task accomplishment

Apart from one member who comprehended the task immediately (an experienced typist), the others needed more time to perform a task. The following difficulties were identified: i.) not able to follow the instructions; ii.) typing problems or finding the right icon, command or folder; iii.) confusion due to unclear or complex instructions.

- Lack of familiarity with the terminology

The teacher was required to explain specific IT terminology (for example, World Wide Web, browser/navigator, virus, modem, and bookmarks) with simple examples.

- Health conditions

The following significant health problems were indicated related to the ageing process (see section 2.3.5.15):

- **Partial deafness:** The participants were not able to hear the teacher's instructions clearly because the room where the course took place adjoined

a communal area, and various sounds, such as conversations, the sound of the doorbell, and so on were severe distractions.

- **Visual impairment:** Most of the participants wore glasses.
- **Physical impairment:** Coordination problems were evident, especially with holding small objects and using the mouse.
- **Concentration:** No serious problems with concentration were indicated; the participants listened carefully and concentrated on the teacher's explanations. However, one of participants showed some signs of dementia.
- **Cognition impairment (mainly short term memory):** Some minor cognition-memory problems were indicated (for example, participants needed the teacher to repeat certain tasks several times in order to remember them correctly; especially if they had not attended for a few days). As was mentioned before, one participant had minor signs of dementia, and therefore he required more attention.

4.3.3.4 PRACTICAL IMPLICATIONS

Based on observations, the following guidelines for facilitating creative engagement were designed (see section 2.3.5):

- **Appropriate time:** The most appropriate time for performing creative activities with this group was between 10 am to 2 pm.
- **The length of activities:** The most appropriate length for the creative activities was between 3 - 4 hours (the length of the course). The participants needed to have enough time to perform and complete a task.
- **Familiar environment:** Participants needed to feel comfortable in the environment where the creative engagement took place and know that they can get help if required.
- **Facilitator:** The facilitator needed to be IT-experienced and familiar with the participants and had to have full control over the creative activity.
- **Group size:** smaller groups (between four and seven participants) were more suitable for conducting creative activities.
- **Short breaks:** Short breaks needed to be provided every 45 minutes to one hour, lasting for at least 10 minutes.
- **Refreshments:** The participants needed drinks and light meals during the session.
- **Disruption:** It was necessary to use a quiet place for conducting creative activities with this group of older people.

- **Terminology:** Before taking part in creative activity it was essential to explain specific terminology to participants who might not be familiar with it (for example device, digital, electronic).
- **Precise and clear instructions:** Instructions needed to be simple and clear and delivered in both verbal and written form, and also in large format for some.
- **Reward:** The participants needed to be rewarded for attending a creative workshop.

4.3.4 DISCUSSION

4.3.4.1 STATEMENT OF RESULTS

The education process for active old people in the Hackney Silver Surfers Centre was investigated in this section. Besides the four main aims, special attention was paid to the implications that need to be addressed before this group of older people can participate in a creative workshop. Results are given under the research aims:

a.) Experiences with information technology

The participants observed on the basic computer course had previously varied experiences with computers. Some were complete beginners, while others had used a computer long ago and were now returning to refresh or improve their knowledge.

b.) Existing approaches and processes

The active older people were highly motivated to actively participate in the adapted learning process. The motivation of this group was based on wanting to be connected with their children and younger relatives, learning something valuable, and being a part of the IT society. During the sessions participants helped each other and posed questions. The teaching strategy was tailored to older students. With appropriate content and rhythm, continuous rehearsing of the new topic and regular breaks throughout, the learning process, common and assistive technologies (smart board) were applied in order to help the teacher deliver study material and allow older people to follow the delivered topics in an effective way.

c.) Factors that stimulate or inhibit creativity

No particular factors that stimulated creativity this group were indicated. However, it is necessary to mention the positive outlook of the learners and their high level of motivation. Three factors that inhibited creativity with this particular group were identified: slower task accomplishment, not being familiar with the terminology and age-related health conditions. However it is possible to address these concerns with practical implications.

d.) Practical implications

These observations focused on practical constraints, which need to be taken into account before involving a group of older people in the creative design process. Twelve constraints are listed in Table 6 below.

Practical implications	The active older people
The appropriate time for meetings	The most appropriate time for performing creative activities with this group is between 10 am to 2 pm.
The length of activities	The length of activities needs to be between three and four hours.
Familiar and accessible environment	Participants need to feel comfortable in the environment where the creative engagement takes place and they to be assured that they could get help if they required.
Facilitator	Facilitator needs to be IT experienced and familiar with the participants' requirements, as well as needing to have a comprehensive view of the situation during creative activity.
Size of the groups	Smaller groups with between four and seven participants are more appropriate for this group.
Short breaks	Short breaks need to be provided each 45 min to one hour for at least 10 min.
Refreshments	Participants need to be served with refreshments and light meals during the creative session.
Disruption	For conducting creative activities with this group it is necessary to provide a quiet place.
Terminology	At the beginning it is necessary to explain certain specific terminology (for example device, digital, electronic).
Precise and clear instructions	Instruction in worksheets needs to be simple and clear and delivered in verbal and written form.
Reward	Participants attending the creative workshop need to be rewarded for their participation.

Table 6: Practical implications for the active older people.

4.3.4.2 UNEXPECTED OUTCOMES

One unexpected finding from the observations was that the teacher applied highly advanced technology (for example, a smart board) during the sessions. Another interesting discovery was the determination, serious approach, unique personality and high motivation of the oldest participant (in his middle eighties) who attended at the course. Another surprise was how well-attended the Centre was, which appeared to function as a meeting point for Hackney's older people. Additional interesting discoveries were very advanced worksheets and a systematic teaching approach, supported by the experienced tutor. Finally, it was

fascinating to observe the entire organization of the centre functioning, with its highly professional and open-minded manager.

4.3.4.3 POSSIBLE EXPLANATIONS FOR THE RESULTS

The enthusiasm of the learners for education could be explained by their need to use a computer, as well recognising the benefits it could bring to their lives. Furthermore, they were still active and they wanted to use their leisure time efficiently. However, the education system for this population requires a carefully-tailored approach, as well as appropriate teaching facilities and a skilled tutor. The ageing process can affect the learners' engagement, but not dramatically. Therefore, if appropriate strategies are employed it should not be problematic to involve this group in the creative process.

4.3.4.4 COMMENT ON FINDINGS

Based on these findings, it was decided that this group is suitable for future creative engagement. However, it is necessary to consider various practical implications before involving them.

4.3.4.5 IMPLICATIONS: PROPOSED METHODS

This finding has important implications for the subsequent observations conducted with the designers. The evidence from this study strongly suggests that active older people are able to participate in group activities. In addition, this research has thrown up the following guidelines for applying methods. They need to be:

- related to participants' experiences with computers and their life experiences
- clear and easy to understand
- applicable in smaller groups

In addition, these findings demonstrate the importance of employing explicit practical constraints for this group.

4.3.4.6 SUGGESTIONS FOR FUTURE WORK

In the future it might be necessary to consider a study that looks at active older people from a creative perspective, for example, observing drama or creative writing classes. It might also be rewarding to visit and carry out examinations of other activities organized by Hackney Silver Surfers Centre to get additional information and a broader view of this group.

4.3.5 CONCLUSIONS

4.3.5.1 SUMMARISING THE CONTENT

Active old people from the Hackney Silver Surfer Centre were observed on a basic computer course called *“Word-processing with MS Word, World-Wide Web and Email”*. Observations were made on following topics: participants’ experiences with the information technology, applied processes and approaches, factors that stimulate or inhibit creativity during creative engagement, and practical implications. However, the question of how to motivate this group and what the practical implications are that need to be considered when involving active older people in creative engagement was given special attention. Results are presented under each research aim. This is followed by a discussion, a conclusion and a summary.

4.3.5.2 SUMMARISING THE FINDINGS

This study has found that the observed group of people had a variety of experiences with technology, and specifically with computers. Another important finding was the high motivation of the learners related to the need to be connected to their extended family via the Internet. The group of people preferred actively participating during the learning sessions but teaching strategies needed to be specially adapted for the group with an appropriate rhythm of delivering study material, regular breaks and so on. In addition, the usual assistive technology was applied. Furthermore, no factor that especially stimulated creativity was indicated, although slower task performance, specific terminology and mild health problems were all noted as factors that inhibited creativity. Finally, numerous practical constraints were pointed out, for example, the importance of a skilled facilitator, the size of the group, appropriate space, and so on.

4.3.5.3 SIGNIFICANCE OF THE FINDINGS

These observations were important to justify the decision to involve this group of people in future creative activities, but under the condition of considering numerous practical constraints. However, it would be inappropriate to present gathered results to a broader audience, since the study was done with a small group of older people.

4.3.5.4 RECOMMENDATIONS FOR FURTHER WORK

These findings lead to the following recommendations for observations of the designers’ group:

- gain more understanding about the designers' experiences with technology
- be familiar with the design process
- obtain more knowledge on bringing together designers and older people in the creative design process

4.3.6 SUMMARY

Findings from this section are listed in the Table 7 below:

Findings	The active older people
1.) Experiences with information technology	
	Had little or no experience with computers.
2.) Existing approaches and processes	
a.) Participants' motivation to participate in the activity	Motivation of participants varied: participating in a group activity, successfully completing a task, the desire to learn something new. Internet users wanted to be closer to their family, spend their leisure time more beneficially, learn something valuable and new, socially interact with peers and to be part of the IT society.
b.) Engagement in a group's activities and group dynamics	i.) Liked to catch to each other ii.) Enjoyed being actively involved in the learning process iii.) They were interested in new challenges
c.) Applied approaches and methods	N/A
d.) Applied processes	Applied learning process, with specific modifications (e.g. revision, material need to be delivered in oral and written form, in large print).
e.) Applied technologies during the process	i.) Ordinary (PC, smart board) and assistive computer equipment (touch-screen monitors, keyboard with larger keys) was applied ii.) Participants used an accessibility interface with full-size icons
3.) Factors that stimulate/ inhibit creativity	
a.) Factors that stimulate creativity	/
b.) Factors that inhibit creativity	i.) Slower task accomplishment ii.) Unfamiliarity with the terminology iii.) Age-related health conditions (partial deafness, visual impairment, physical impairment, lack of concentration, cognitive impairment – mainly problems with short term memory)
4.) Practical implications	
	i.) Appropriate time ii.) Appropriate length of activities iii.) Familiar environment iv.) Experienced facilitator v.) Small size of group vi.) Short breaks vii.) Provide coffee and tea viii.) Minimise disruption ix.) Explain terminology x.) Provide precise and clear instructions, in verbal and written form xi.) Reward people for participating

Table 7: The summary of the active older people section.

4.4 HCS STUDENTS (FUTURE DESIGNERS)

4.4.1 INTRODUCTION

The main aim of this section is to investigate the design process of a group of postgraduate students. During the observations the following issues were explored: the participants' experiences with technology, existing approaches and applied processes, factors that stimulate or inhibit creativity, and practical implications. However, the main focus was on the design process itself.

Having completed observations at the Hackney Silver Surfers Centre in winter 2007, it was also necessary to observe a group of the future designers. The reason for this was to complete the plan to conduct a comparative study with the group of active older people. The most suitable opportunity for this emerged at City University London where students on the Human Centred System Programme (HCS) were designing an interactive device for the 2012 Olympic games on an Inclusive Design module.



Figure 22: HCS students attending at one of their first meetings where they discussed ideas.

In this section the method and design of the study will first be presented. Next details on applied materials and procedure of the observations will be presented, followed by results, which will be presented under the same structure as established aims for Study 2. At the end of this section a discussion, a conclusion and a summary is presented.

4.4.2 METHOD

The observations were performed with the aim of obtaining important information on an observed group of users. The Human Centred System students were observed during the design process of the Inclusive Design module.

4.4.2.1 DESIGN

In early 2008 the second of the three set-up groups of students on the Inclusive Design module was observed. I was introduced to the students by former supervisor, who taught this module. The observations took place from the beginning of the spring semester in February to the end of April 2008 on different days of the week, depending on the students' design process during the module. Their main coursework assignment was to design a portable information appliance for the 2012 Olympic games in London. The special focus of this design task was on designing a device for people with different disabilities. This particular group of students were focusing on the following disabilities: users with age-related visual impairment, hearing and cognitive impairment and those with autism (Adam et al., 2001). Meetings were carried out at different locations within City University London (for example, in the focus room, library study room and at the common area in the department for HCID). The first few meetings were held in a focus room after the Tuesday lecture; at the end of their design process, when additional work was required, meetings were more frequent and were held at different places (HCI centre kitchen, study room in the library or Interaction lab). Students informed me by e-mail or text messages where their meetings were to be held, as well as the content of the meetings, their action plan and group project notes. Since students lacked participants, I offered to take part in their pilot evaluation where their final paper prototype was evaluated. Students were rewarded at the end of the observation process with a Border's voucher for £5.

4.4.2.2 PARTICIPANTS

The groups consisted of four postgraduate students aged from 25 to 28 years. The postgraduate students were part of the Human Centred System (HCS) course (MSc programme) (see Figure 22) taking the Inclusive design module. The three male learners were full-time students and the female student was part-time. Three of them were UK citizens and the other was Norwegian.

4.4.2.3 APPARATUS AND MATERIALS

During the observations written notes were made using pencil and paper; a digital camera was used for taking photos. A dictaphone was not used, since the students' design process was considered more important than the details of their conversation.

4.4.2.4 PROCEDURE

Firstly, the purpose of the study was explained to the students and how the data would be used. The students were observed throughout the entire design process, from research stage through to the evaluations. Written notes were made at each stage. At the end of the process I participated as a volunteer in their pilot evaluations.

4.4.3 RESULTS

The results, based on observations, notes and the postgraduates' coursework report, are presented in the following sections:

- **Experiences with information technology**
- **Existing approaches and processes**
- **Factors that stimulate or inhibit creativity**
- **Practical implications**

4.4.3.1 EXPERIENCES WITH INFORMATION TECHNOLOGY

Designers were very experienced and applied various technologies during the design process. For example, they used laptops and a variety of software applications during the design process, and also used mobile phones for communicating. Furthermore, technologies related to testing usability (e.g. an eye tracker) were applied. The group used Google Documents during evaluations and the writing seminar.

4.4.3.2 EXISTING APPROACHES AND PROCESSES

a.) The participant's motivation to participate in the activity

The main motivation for this group was the need to complete their coursework for the module. However, the following additional reasons for motivation were identified:

- content of the module and the design task

Students were very interested in the design process and different challenges were presented.

- working in a group

Working together and exchanging ideas with others motivated members.

- working to a deadline

The designers were working to a strict schedule and were very motivated to finish their work on time.

b.) Engagement in group activities and group dynamics

The individual's role inside the group varied, depending on individual personal skills, preferences and the design stage, when time was limited and specific skills were required. For example, the student with drawing and modelling skills modelled the mock-up model; another very organised student took over all activities related to meetings (for example, arranging meeting leadership, preparing the time schedule, making notes during the discussions, preparing the action plan for the next gathering and so on). Furthermore, other individuals' roles inside of the group changed depending on the stage of the design process and the need for certain abilities. For example, a group separated into two parts to design the interface: two members designed a mock-up model, and another two developed an interface.

c.) Applied approaches and methods

During the entire design process different HCI methods were applied; for example, a Questions Options Criteria (QOC) diagram was used at the design development stage. Then, scenarios and storyboards were employed to utilize the most interesting design ideas, and to identify the advantages and disadvantages of each proposed design. Finally, questionnaires, scenarios and evaluations were used at the evaluation stage.

d.) The applied processes

Designers were engaged in complex four-stage design processes with the following stages: collecting information, design development, prototyping, and evaluation.

- The collecting information stage

Students based design requirements for their application on a literature review and the state-of-the-art technology. At this stage they used Internet sources and printed material (books, conference papers), and they shared their life and work experiences at the meetings or by e-mail.

- The design development stage

Based on these design requirements, students developed several ideas linking existing technologies with future ones which will be available at the time of 2012 Olympic games. In the first part of the meeting each student was given an opportunity to present their ideas,

designs, or prototypes to the rest of the group, who would then discuss them. The students considered the advantages and disadvantages of each proposal in order to find a solution that would be appropriate for all Olympic events, and which would also be suitable for the disabled groups that the students had studied separately. At this stage, each member of the group proposed their design ideas in the form of sketches (see Figure 23) (Adams et al., 2001).

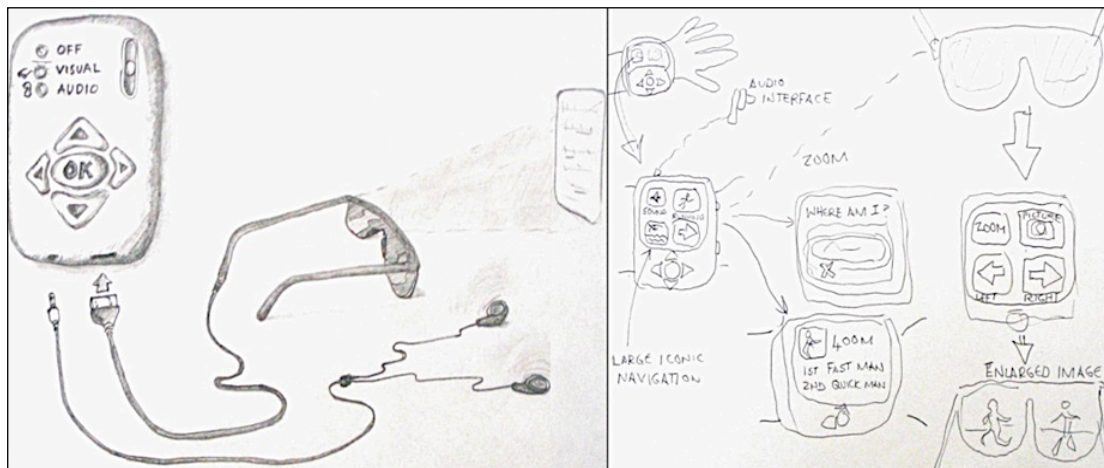


Figure 23: HCS students' sketches: sketches of the interactive device (left) and interface (right).

- **The prototyping stage (including modelling 3D forms and designing the interface of the interactive device)**

At this part of the design stage two decisions took place simultaneously: modelling the 3D mock-up model and designing the interface for the proposed prototype. The mock-up model was made out of a polymer clay named FIMO (see Figure 24, left and right), which represented the real size model with a display and five navigation buttons. The purpose of this model was to test the size of the device, navigation keys and ergonomics. During the design of the interface (see Figure 24), which was based on existing mobile phone interfaces (e.g. Nokia), the designers discussed the following issues:

- the possible options for the interface design (for example, what would be the format of the display, graphics, icons, symbols, images, the size of the text, the appropriate typography, transparency, and translucency),
- the incorporation of sound into the interface of the mock-up model, and
- navigation through the system and users' interaction with the interface.



Figure 24: HCS students' clay prototype: simple clay prototype to define the size, functions of the device, ergonomics (left and right) and use (middle).

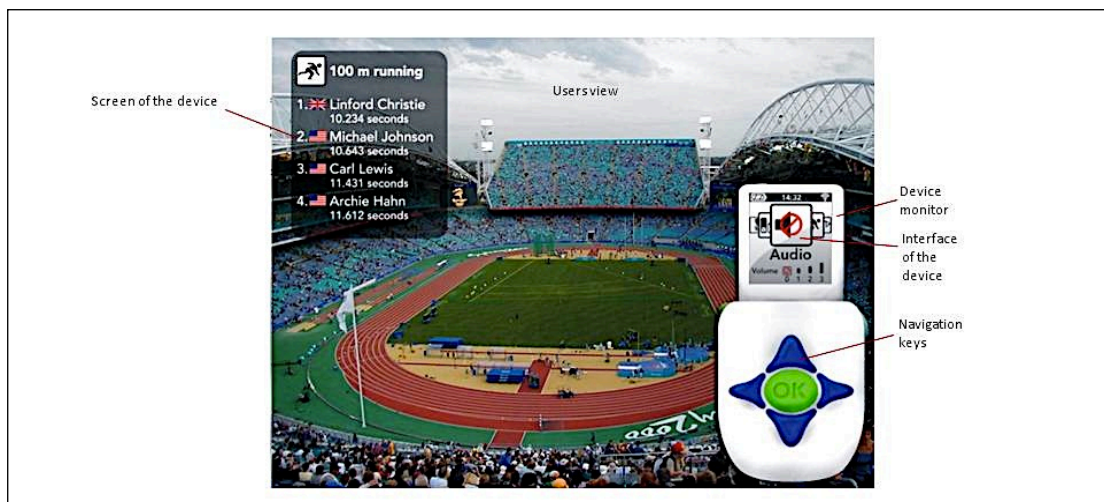


Figure 25: Testing interface of the mock-up model: for testing the device students combined stadium photo (middle), interface (left) and mock-up model (right).

In addition, at this stage issues related to current work were discussed, such as adoptions of the model by different user groups, and the advantages and disadvantages of each proposed solution. Furthermore, they discussed matters relating to future work, for example: where to find the appropriate participants for the evaluations, how to carry out the evaluation process, and tasks that participants needed to complete during the evaluations procedure.

- **The evaluations of the mock up-model**

The students carried out three evaluation sessions: the first pilot study was with an international PhD student (myself), the second with a blind participant, and the third with the RNIB project manager (see Figure 26). The evaluations included a pre-questionnaire, scenarios based on which participants needed to perform the required tasks, and discussion of the evaluations. For usability testing of the interactive prototype, the designers employed an eye tracker to measure the participant's navigation and a computer to simulate the device interface. During the evaluation process the group was divided into pairs; the first pair focused on preparation of the prototype for testing, while the second one prepared testing material (consent forms and questionnaires). Using the evaluations, students observed participants' interaction with the model and made notes of different usability issues.



Figure 26: Participants at the evaluations: the PhD student evaluates the prototype.

e.) Applied technologies during the process

Different technologies were employed at different stages of the design process. Over the entire process students used laptops for their main work, and during the research phase they employed on-line resources as an important source of information. For prototyping, designers made use of a range of graphical software, such as Illustrator, Photoshop, HTML and CSS, and for designing the interactive part of the prototype the Dreamweaver web design tool was applied. Eye tracker was used for evaluations at the end of the design process. For the writing-up stage students utilized Google Documents, and e-mails and

mobile phones (calls and text messages) were used for communication during the design process.

4.4.3.3 FACTORS THAT STIMULATE OR INHIBIT CREATIVITY

a.) Factors that stimulate creativity

Through observing the design process of the HCS students only two factors were noticed that stimulated creativity within the observed group:

- **use of materials at the prototyping stage**

The different raw materials were important for expressing and testing students' ideas in the prototyping stage of the creative process. Therefore, for prototyping the mock-up model different modelling and building materials (see Figure 24) such as polymer clay, blue-tack, different parts of old plastic sunglasses, and non-functioning earphones were applied.

- **diverse experiences, but the same backgrounds**

The designers in the group had diverse talents and abilities that helped them at the creative stage of the design process and during the final phase where they need to complete the project. On the other hand, all members were from the same course and were roughly the same age, which might have been a disadvantage.

- **use of technology**

The participants were inspired while designing their Olympic game interactive device by the newest technology, for example, sensors, clear plastic glasses where information could be projected, navigation using mobile phones, headphones and so on. In their design they brought these technologies together and linked them in a new device.

b.) Factors that inhibit creativity

One factor that inhibited creativity in the group was noticed:

- **better time management**

The students reported that a lot of time was spent on designing and developing the interactive prototype; therefore, they stated that there was less time to test the prototype with different disabled participants (Adams et al., 2001).

4.4.3.4 PRACTICAL IMPLICATIONS

During the observation the following practical implications were identified:

- **Appropriate time for meetings:** The most appropriate time for meetings was early afternoon. However, at the end of the process meetings were more frequent and at different times of the day.

- **Length of meetings:** Students met for short periods of time (two hours). At the end of the design process meetings were longer (four to five hours) and more frequent.
- **Size of the group:** The smaller groups with four participants were the most appropriate for work.
- **Group dynamics:** Group dynamics changed depending on participants' skills and the stage of the design process.

Finally, it might be interesting to add a comment from the designers' report, where designers highlighted the importance of the focus on different disabilities and the desirability of having more opportunity to test disabled people (Adams et al., 2001). On other hand, the group reported on the difficulties of getting participants with disabilities to test the final prototype.

4.4.4 DISCUSSION

4.4.4.1 STATEMENT OF RESULTS

The design process of the Human Centred System postgraduate students was examined. Besides general aims this section focuses on the four design processes that have been previously identified. The results are presented under the four research aims:

a.) Experiences with information technology

Postgraduates were very experienced with current technology and they utilized a variety of technologies and software e.g. Eye-Tracker and Google Documents, for the duration of the design process.

b.) Existing approaches and processes

Students were enthusiastically engaged throughout the entire design process and were highly motivated, based on the content of the module and the design task, group design and the need to work to a deadline. Roles within the group were dynamic and changed over the design process, depending on what skills were required from designers.

The four-stage design process was then applied with the following stages: i.) the collecting information, ii.) the design development stage, iii.) the prototyping stage (modelling 3D forms and designing the interface of the interactive device), and iv.) an evaluation of the mock up model. Afterwards, various HCI methods were utilized, such as Questions Options Criteria (QOC) diagrams, scenarios and storyboards.

c.) Factors that stimulate or inhibit creativity

Three factors that stimulated creativity in this group were indicated: the use of materials at the prototyping stage, the use of technology and the diverse experiences of the designers. The last factor inhibited creativity as well, due to the similar background of group members. Only one other factor that might inhibit creativity was pointed out: students wished to have better time management, which would have allowed them to test their prototype with a greater number of disabled people.

d.) Practical implications

The following practical implications need to be considered in order for this group to engage in creative activities.

Practical implications	The HCS students
Appropriate time for meetings	Early in the afternoon; at the end of the process meetings were more frequent and at different periods of the day
Length of meetings	Variable: at the beginning of the design process two hours; at the end of the design process meetings were longer (four to five hours) and more frequent.
Size of the group	Smaller groups with an optimum of four participants
Group dynamics	Variable: depended on participants' skills and stage of the design process

Table 8: The practical implications for HCS students.

4.4.4.2 UNEXPECTED OUTCOMES

No unexpected results were found, apart from designers wanting more involvement of disabled participants in the design process.

4.4.4.3 POSSIBLE EXPLANATIONS FOR RESULTS

It was expected that this group would have the most experiences with technology as they were students were on an advanced course and some of them were working as well. Moreover, they were able to adopt design processes with the application of a variety of methods and technologies.

4.4.4.4 IMPLICATIONS: PROPOSED METHODS

The group successfully used the following methods during the design process:

- simple four-stage process
- scenarios, starboards

- using different raw materials for building the model at the prototyping stage
- applied methods that involved sketching ideas
- ideas only expressed verbally.

4.4.4.5 SUGGESTIONS FOR FUTURE WORK

It might be necessary to look more deeply at user involvement in the design process, since students complained that they did not have enough contact with the final user. The implications of this work will be discussed in the next chapter.

4.4.5 CONCLUSIONS

4.4.5.1 SUMMARY OF CONTENT

A group of four future designers were observed during the design stage of a portable interactive device. Observations were made on four areas: the designers' experiences with information technology, existing approaches and processes, factors that stimulated or inhibited creativity and practical implications. Observations focused on the design process of the group. This section is concluded by a brief discussion of the results.

4.4.5.2 SUMMARY OF FINDINGS

The results showed that this particular group was very familiar with the newest technology applied during the entire design process, for communication and exchanging information. The main factors that motivated the group were the content of the module and design project, working in a group and the need to meet deadlines. The next finding was that the roles inside the group were constantly changing and adapting to the dynamics of the design process. It was also observed that the group applied a four-stage design process involving a design development phase, collecting information, prototype development and evaluation. The designers applied various HCI methods, such as QOC diagrams, scenarios, storyboards, questionnaires and so on. They also employed different technologies at different stages of the design process, for example laptops over the entire process, the Internet, a variety of graphical software (such as, Photoshop and Illustrator) Eye Tracker, Google Documents and so on. Three factors that stimulated creativity were identified: the use of materials at the prototyping stage, the diverse experiences of the designers, and use of technology. Only the inappropriate time management and the designers' similar background were indicated as factors that inhibited the designers' creativity. At the end several practical implications were identified, including the importance of time management and the length of the meetings.

4.4.5.3 SIGNIFICANCE OF FINDINGS

The results were very important for future studies, although they are not applicable for a broader community as the study observes only a limited approach of one small group of designers.

4.4.5.4 RECOMMENDATIONS FOR FURTHER WORK

The implications of this work will be discussed in the next chapter.

4.4.6 SUMMARY

Findings from this section are summarized in table 9 below:

Findings	The postgraduate students (future designers)
1.) Experiences with technology	
	Applying technologies related to working/design process (computer, various software applications) communication (mobile phone), group work (Google Documents) and technologies related to testing usability (eye tracker).
2.) Existing approaches and processes	
a.) Participants' motivation to participate in activity	i.) Content of the module and the design task ii.) Working in a group iii.) Working to a deadline
b.) Engagement with group's activities and group dynamics	i.) Division based on individual personal skills and preferences ii.) Roles inside the group changed depending on the stage of the design process iii.) they were interested in new challenges
c.) Applied approaches and methods	Different HCI methods were applied: Questions Options Criteria (QOC) diagram, scenarios, questionnaires, usability test
d.) Applied processes	Applied 4 stage process: i.) The collecting information stage ii.) The design development stage iii.) The prototyping stage iv.) The evaluations of the mock-up model
e.) Applied technologies during the process	Laptops throughout the entire process Collecting information: on-line resources Prototyping: graphical software (Illustrator, Photoshop, HTML, CSS, Dreamweaver) Writing-up stage: Google Documents Communication: e-mails and mobile phones (calls and messages)
3.) Factors that stimulate/inhibit creativity	
a.) Factors that stimulate creativity	i.) Use of materials in the prototyping stage ii.) Diverse designers' experiences iii.) Use of technology
b.) Factors that inhibit creativity	i.) Better time management
4.) Practical implications	
	i.) Appropriate time ii.) Appropriate length of meetings iii.) Small size of group iv.) Variable group dynamics depending on participant skills and stage of design process

Table 9: Summary of the HCS students' section.

4.5 IMPLICATIONS FOR THE PILOT STUDY: TESTING THE CREATIVE DESIGN PROCESS

4.5.1 DISCUSSION OF FINDINGS FROM THE THREE OBSERVATIONAL STUDIES

4.5.1.1 BACKGROUND INFORMATION: RESEARCH AIMS

Throughout these observations the creative engagement with the very old people at the Vintage Club in Muswell Hill, then the learning process with the active older people at the Hackney Silver Surfers Centre, and the design process with the postgraduate students (future designers) from City University London, were carefully studied. During these observations the following subjects were investigated: the participants' experiences with information technology, applied existing approaches and processes, factors that stimulate or inhibit creativity in the creative engagement, and lastly practical implications that need to be considered when involving older people in the creative design process. In addition, special attention was paid to the very old people concerning creative stimuli, to the active older people on practical implications and to the designers regarding the design process.

4.5.1.2 STATEMENT OF RESULTS

Results are presented for the three observed groups:

a.) The very old people from the Vintage Club

This group of older people did not employ any modern technology or have any wish to do this in the future. They were highly motivated to attend the club meetings mainly for social reasons; however, they preferred passive rather than active engagement, although the facilitator and speakers applied innovative approaches and different technologies during the presentations. The creativity of this group was triggered by simple stimuli, which stimulated their memories; however, their creative engagement was restricted by health problems.

b.) The active older people from the Hackney Silver Surfers Centre

The observed active older people had various experiences with computers, by reason of their various employment paths and occupations, and interests in the past. However, this group was highly motivated to include computers in their daily routine in order to stay in touch with their younger relatives. For this group the learning process was applied with certain modifications, for example, lots of rehearsal, repetition and slower delivery of information. Furthermore, the process employed various forms of technology to help deliver content during the teaching session (for example, a smart board), and assistive technology (for example windows Accessibility Settings). No special factors that stimulated creativity

were observed; however, the older people were highly motivated. On other hand, three factors that inhibited creativity were pointed out: slower task accomplishment, unfamiliarity with terminology and poor health, which can be ameliorated with practical implications. Those were related to, for example, age, terminology, clear instructions, elimination of any kind of disruption, and more time for task completion.

c.) The postgraduate students (future designers) from City University London

The designers were the most familiar with the newest technology and software, which they applied in the design process, communication, group work and testing the prototype. The designers were highly motivated to perform well in their design project. The group dynamic was adapted to the tasks that were required at the different stages of the design process. This group applied the complex four-stage design process with the following phases: collecting information, design development, prototyping, and an evaluation of the mock-up model. Furthermore, a variety of HCI methods were applied to the design process (for example, a QOC diagram, scenarios, and storyboards). Additionally, the designers used e-mails and mobile phones to communicate, and the Internet was used for finding information. Different software was used at the prototyping stage and Eye-Tracker was used for evaluations.

The three factors observed to stimulate creativity in this group were the use of materials at the prototyping stage, the different skills of members, and use of technology. The two factors that might have inhibited their creativity were poor time management and similar background of all members. Finally, it was pointed out in their coursework report that they wished to be more connected with the final user.

4.5.1.3 UNEXPECTED OUTCOMES

a.) The very old people

Health issues and technology adaptation were the most surprising outcomes related to this group. Although participants regularly attended meetings, some health problems prevented them from being more actively engaged. Even when technology was applied at presentations, they did not show any interest in learning and adapting it to their lives.

b.) The active older people

The first unexpected finding was that the teacher applied advanced technology e.g. a smart board, during the teaching sessions. Another surprise was the advanced age of the oldest

participant (middle eighties) and her strong motivation to learn how to use a computer. Finally, the Centre had a highly-qualified and accessible director with a systematic teaching approach.

c.) The future designers

This group complained of the lack of disabled participants' involvement in the design process.

4.5.1.4 LIMITATIONS AND THREATS TO VALIDITY

The observed results from three groups need to be viewed cautiously. It is necessary to bear in minds that the observations were done with small groups of people (the last one less than 10 people) in particular areas of London (e.g. Hackney, which has a specific cultural background) and therefore we cannot apply them broadly. In addition, only one individual visit was conducted to Vintage Club members. However, these results are important in order to design a future pilot study, as well as to justify the decision not to involve the very old people in this.

4.5.1.5 COMMENTS ON FINDINGS

Based on these findings, a decision was made that a group of very old people would not be involved in the future studies. The main reason for this was their preference for passive involvement in the creative process, their lack of use of any kind of modern technology and some severe health problems. However, the lessons from these observations will be applied for the future study.

4.5.1.6 IMPLICATIONS: PROPOSED METHODS FOR THE PILOT STUDY

a.) The very old people

It was decided that this group of participants would not be involved in the future creative engagement; however recommendations for planned methods could be proposed.

Suggested methods for this group are:

- activities which are short in length, simple to understand and interesting
- simple activities that remind participants of games
- activities that would stimulate their memories and life experiences
- activities which engage the entire group
- a more informal approach which is more personal (visit with coffee and tea)

b.) The active older people

This group can be creatively engaged with activities; however, this research suggests the approaches to be trialled in the pilot study should be:

- related to participants' experiences with computers and their life experiences
- clear and easy to understand
- applicable in smaller groups

In addition, the findings demonstrate the importance of considering practical implications for this group as summarised in table 7.

c.) The future designers

This group performed effectively when they utilized the following methods:

- a short four-stage design process
- scenarios, storyboards, sketching ideas
- different modelling materials for building the model at the prototype stage

Approaches to be tested in the pilot study will take these issues into account.

4.5.1.7 SUGGESTIONS FOR FUTURE WORK

A separate study might be considered to investigate the engagement of very old people in the design process and specific ways to address the creative potential of this particular group. It might also be necessary to conduct some observations of older people in other areas of creative engagement, such as drama classes and creative writing, in order to get additional information and a broader view of this particular group. Finally, as the future designers complained about not having enough contact with the final user, it might be necessary to look more deeply at better user involvement in the design process. The proposed methods would be applied and tested in a pilot study and experiences from conducted studies would also be applied.

4.5.2 CONCLUSIONS FROM THE THREE STUDIES

4.5.2.1 SUMMARISING THE CONTENT

In this section two processes of creative engagement were observed: education and design. The first observations were carried out on very old people (mainly in their eighties) at the Vintage Club in Muswell Hill. Observations were also conducted at the Hackney Silver Surfers Centre, and of future designers (in their middle twenties) who were postgraduate students

in the Human Centred System program from City University London. All three observations had four aims and in addition all had a specific focus.

4.5.2.2 SUMMARY OF FINDINGS

The findings showed that very old people at the Vintage Club do not use modern technology (at least not the observed groups), and that they preferred passive involvement. The Hackney Silver Surfers had various experiences with technology, and they were willing to think about how to apply it in their everyday lives. They were highly motivated and willing to learn something new. Common and assistive technologies need to be applied to educational activities and they need to be lead by a skilled teacher. However, numerous practical implications have to be addressed to support creativity in this group. The designers employed the latest technology for work, conversations and group engagement. They applied the four-stage design process supported by various methods and high use of technology at all stages of the design process. However, they wished that people with various disabilities could have been more involved in the design process.

4.5.2.3 SIGNIFICANCE OF FINDINGS

All three observations were conducted with a small number of participants, and therefore the results are not appropriate to be applied to a broader audience. However, the findings were important for planning the next pilot study where the proposed methods would be tested.

4.5.2.4 RECOMMENDATIONS FOR FURTHER WORK

Proposed methods would be applied and tested in the pilot study, and experiences from conducted studies would also be applied.

5 A PILOT STUDY: TESTING THE PROPOSED CREATIVE DESIGN PROCESS

5.1 INTRODUCTION

The main aim of this chapter is to test two issues in the main study: the proposed content of the creative engagement and the procedure for analysing data. The pilot study was based on Study 1, Study 2 and the literature review. It consisted of two parts: the first part involved the Cultural Probes method, and the second part the creative workshop.

This chapter will include the following sections:

- the background to the study with conducted Studies 1 and 2 and the literature review of existing methods applied with older people
- an introduction to the two main aims and objectives
- the applied methods, the design of the study and the participants involved
- an extended introduction to the applied apparatus and materials
- a description of the procedure with the applied Cultural Probes method and the four-stage Poincaré creative process
- results from an analysis of the creative process and the creative output
- a discussion with results and implications
- a summary.

5.1.1 BACKGROUND OF THE STUDY

The design of this study incorporated results from both preliminary studies and the literature review.

5.1.1.1 STUDY 1: EVALUATION OF THE VIRTUAL GARDEN

Applying semi-structured interviews, three aspects of the model were assessed: familiarization with the model, the users' opinion of the model, and its adoption in three everyday situations. The first aspect investigated how participants assessed the model's forms, colours and size. The second part was interested in the participants' criticism of the model, and the last studied how participants were able to use a model in three real situations (for example, being reminded to take some medicine).

The most important result of this study was the finding that using a model designed by designers was not an optimum approach for any group of older people. Furthermore, the

outcomes showed that the design, intuitive interaction with the device and the purpose of the model were not appropriate for older participants. The second important finding was that the methods employed during the standard design process were not the most appropriate. Participants were not completely engaged in the design process and did not have any direct influence on the design of the model. Another important finding was that none of the group thought of older people as potential users. The main reason for that was model's childlike visual appearance. This study also confirmed that, in general, this device was only partly applicable to older users' everyday lives; only the active older people were able to apply it as reminder, for example, to take medicine. The model was not appropriate to be developed further in such a form, especially to be used by older people.

In the future studies it was necessary to think of applying the creative user-centred design process while employing methods where older people were involved in a more active way. Furthermore, the design process and methods needed to be chosen in a way that supported and stimulated older people in expressing their opinions and experiences.

5.1.1.2 STUDY 2: OBSERVING OLDER PEOPLE AND YOUNG DESIGNERS

The observations investigated the creative engagement with the very old people, the learning process of the active older people, and the design process with the postgraduate students. The study investigated the participants' experiences with IT, applied approaches and processes, factors that stimulate or inhibit creativity, and practical implications that need to be considered in the creative design process.

Based on the findings of the observations, a decision was taken that the active older people and the designers were suitable to be involved in the proposed creative design process; however, a particular approach would be required for the very old people. Findings showed that the very old people did not use modern technology and that they preferred passive involvement. The active older people had various experiences with technology, and they were willing to be taught how to use computers in everyday life. They were highly motivated and willing to learn something new. The education process was supported with common and assistive technology and was lead by a skilled teacher. However, numerous practical implications were indicated in order to support older people. The designers employed the newest technology for work, conversations and group engagement. Also, they adopted the four-stage design process supported by various methods and they used technology

intensively in all stages of the design process. However, the designers wanted better involvement of the people with disabilities in the process.

Because the very old people preferred passive rather than active involvement in the creative process, and did not use any kind of modern technology and had severe health problems, it was decided that this group would not be involved in future studies. However, experiences from these observations and from the other two groups would be used in this pilot study. Based on all observations the following recommendations on methods were established for the three groups:

a.) The very old people

- the performances need to be short in length, understandable, interesting, simple and to remind participants of games they are familiar with
- the activities need to stimulate people's memories and life experiences, and to engage the entire group
- there should be informal and personal conversations (for example, visits with coffee and tea)

b.) The active older people

- the activities should relate to participants' computer and life experiences
- the activities should be applicable in a smaller group, instructions should be clear and easy to understand

c.) The future designers

- scenarios, storyboards need to be used
- different raw materials should be applied for building the model at the prototype stage
- various ways to express ideas should be employed, for example, sketching ideas, building paper prototypes or verbally expressing ideas
- there should be a simple and short four-stage design process

5.1.1.3 EXISTING METHODS BASED ON LITERATURE REVIEW

There are existing studies involving older people, such as those on traditional methods (for example interviews, hands-on methods), the participatory design approach (Coleman et al., 2004), alternatives, e.g., Forum Theatre techniques (Newell et al., 2006) and experimental

techniques, e.g. Cultural Probes (Gaver et al., 1999) the user-centred design process, co-creation with adapted Design Probes (Mattelmäki, 2006) and Make Tools (Mattelmäki, 2003).

Based on the literature review, it was decided that the Cultural Probes method would be applied at the preparation stage of the creative process (Gaver et al., 1999) for three main reasons: i.) its creative approach to collecting people's experiences, ii.) its appropriateness when applying it at the early stages of the creative design process, and iii.) its success when applying it with different sets of people and domains. Poincaré's (Wallas, 1926) creative process was adopted for the second part of the creative engagement because of its simplicity (four stages) and frequent adoption. Additionally different creative triggers were applied (Loi, 2007) that stimulated creativity in the participants involved.

5.1.2 AIMS AND OBJECTIVES

The Pilot Study had two main aims, with additional objectives:

1.) To test the proposed content of the creative engagement in the main study

During the study the following objectives were tested:

a.) Proposed four-stage creative design process and creative methods

More specifically, the method's appropriateness for designers and older participants was investigated, as well as the structure of the study, and techniques to express the participants' ideas.

b.) Practical implications

This included testing the time spent on tasks, the breaks required during the sessions, the most appropriate length for activities, and the possible difficulties in delivering instructions and assessing creativity during the creative engagement.

c.) Recording data settings

The most appropriate way to capture various data during the creative workshop was investigated, and whether there was a need for an assistant.

2.) To test the procedure for analysing data in the main study

The following objectives were further investigated:

a.) The most appropriate method to assess qualitative data during the creative process

The intention was to explore effective approaches to analyse large and diverse amounts of data.

b.) To identify potential phenomena that would be assessed during the creative process

The aim was to find analogies (relations) amongst the data, and definitions of investigated phenomena.

c.) The most appropriate approach for assessing the final output

The goal was to find a method for assessing the final paper prototypes.

5.2 METHOD

The creative engagement based on the four-stage creative process included activities designed to support preparation, incubation, illumination and verification (Wallas, 1926). This study had two main parts: the first was conducted individually, and the second in a group.

a.) The Cultural Probes (completed individually)

At this stage the experimental method called the *Cultural Probes* was applied with three main aims:

- a.) To reflect on how older people and designers use computers in their daily routine with the aim of preparing the participants for the second part of the study
- b.) To familiarise them with the methods to be applied in the second part of the study
- c.) To establish a more personal relationship with the facilitator.

b.) The creative workshop (completed in a group)

The main purpose of the creative workshop was to design a new device for older people, based on experiences from the first part of the study. The overall structure of the creative workshop was divided into several sessions with different methods applied in order to stimulate creativity, measure the creative process and improve the final output. At the creative workshop the four-stage Poincaré (Wallas, 1926; Cropley, 2001:73) creative process was applied, with the following stages:

- The preparation stage, where participants become familiar with the problem in order to find solutions (convergent thinking)
- The incubation stage, where people become creative by making associations (divergent thinking and configuration (Cropley, 2001)
- The illumination stage, where individuals recognize a promising new configuration (Cropley, 2001)
- The verification stage, where individuals evaluate novel and appropriate solutions.

During the creative workshop the designers and the older people were involved in the listed stages of the creative process (see Figure 27). The incubation stage was supported in the workshops by the use of Ice Breaker sessions, where participants were asked to tell others about their most pleasurable experiences with their favourite devices. Support for this stage involved the use of brainstorming²⁰ around four key questions (for example, What should the device be used for?), stimulated by use of *Creative Cards*. At the end of this session participants had a chance to vote for the *Golden Idea*, which was then developed further in the illumination stage. In this stage participants were asked to develop and verify their ideas in three different ways: visually, using storyboarding techniques; as a concrete prototype, using materials from a '*Magic box*' (Sitorus and Kilbourn, 2007); or verbally, by recording an oral description or written concept definition. Finally, participants were given a questionnaire and asked to evaluate the novelty, appropriateness and reliability of ideas from their own and other groups, and the methods that had been used in the process as a whole (Sustar et al., 2009).

The structure of the pilot study				
Stage of the study	4-stage creative process	Participants	Creative methods	Design task
1. First stage	1. Preparation	1. Designers 2. Active older people	Cultural Probes - done individually	Users asked to explain relationship with their computer
2. Second stage	1. Preparation 2. Incubation 3. Illumination 4. Verification	Designers + Active older people	Creative workshops - group activity	Users asked to design a digital device

Table 10: The structure of the pilot study.

²⁰ Brainstorming is "a technique for increasing idea generation that emphasises quantity of ideas and deferred judgment" (Paulus, 1999:779).

5.2.1 DESIGN

The study was based on two stages: during the first stage participants were required to work individually on the Cultural Probes for 10 to 14 days, and during the second stage they were invited to take part at a one-day (five-hour) creative event (see Table 10).

The entire process had five stages and started at the beginning of October 2008 with the design of the Cultural Probes (stage 1, see Figure 27). Two presentations were made at the Hackney Silver Surfers Centre (stage 2, see Figure 27) in the middle of November 2008 with the aim of recruiting participants for the study. The researchers (designers) were recruited by e-mail after a message was sent to all staff in the Centre for HCI Design. After the recruitment Cultural Probes were delivered to the participants at the beginning of December (stage 3, see Figure 27). Interviews with the participants were held in late December (stage 4, see Figure 27). The creative workshop was conducted in the middle of January (stage 5, see Figure 27).

In terms of ethical issues, all participants were given the Explanatory Statement and the Informed Consent Form to sign as part of the Cultural Probes (Workbook and Instructions booklet). All three participants attended the study voluntarily and they did not receive any reward. However, free lunch was provided for them.

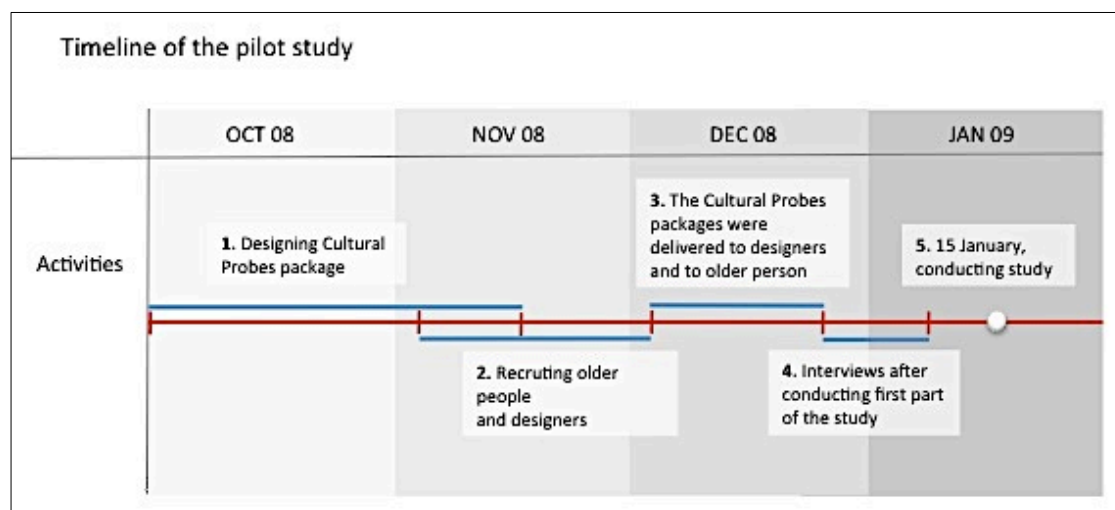


Figure 27: The timeline of the pilot study: different stages in the pilot study.

5.2.2 PARTICIPANTS

The pilot study was conducted with one creative group composed of three participants: two designers and one older person. The senior lady, in her middle sixties, was recruited from the Hackney Silver Surfers Centre (London). The PhD student with an HCI background, and MSc student (both in their middle twenties) was recruited from the City University London, Centre for HCI Design (see Figure 28). Three other older participants were involved in the preparation stage; unfortunately, two people resigned from the study for health reasons and a third one left the study for unknown reasons.



Figure 28: The participants in discussion at the creative workshop.

5.2.3 APPARATUS AND MATERIALS

The pilot study used various methods at different stages of the creative process to gather data and promote creative engagement. The following apparatus and materials were used:

1.) Apparatus

- Video camcorder with video camcorder tapes (2 items)
- Tripod
- Digital camera for taking stills during the creative sessions
- Dictaphone for recording interviews after the Cultural Probes study and for gathering data during the creative workshop
- Laptop and projector for projecting the Power Point presentation

2.) Materials

The main material here was The Culture Probes, which consisted of three booklets.

a.) The Culture Probes (“*the package*”)²¹

- The Workbook with Instructions booklet (see Appendix 8)
- The Diary booklet
- Accessories

For a more detailed description on the materials used for the Cultural Probes see next chapter, section 6.2.1.3.

b.) The Creative Workshop

At the Creative Workshop several different methods were applied.

Methods

- Cultural Probes (Figure 29)
- Power Point presentation
- Ice Breaker (see next chapter, Figure 51)
- Scenario (see next chapter, Figure 53)
- Creative Cards (and blank ones) used at the Incubation stage (see next chapter, Figure 54 and 55)
- Worksheets: ‘*Tell me*’, ‘*Draw it*’ and ‘*Make it*’ at the illumination stage (see Figure 34)
- Questionnaire for collecting quantitative data at the Validation stage (see Appendix 9)

For a more detailed description on the methods applied see next chapter, section 6.2.

Stationery

Various printed materials were used at the creative workshop:

- red and yellow labels indicating participants’ names in the group
- office stationery (for example, stickers for voting on the Golden Idea at the Incubation stage, markers, scissors, blank white paper) (see Figure 29)
- blank A5 notepads for the brainstorming session (see Figure 29)
- blank A1 notepads for collecting ideas (see Figure 29)

²¹ For the older participants the Cultural Probes were called “the package” (see Figure 29).

Printed material

- timetable for the creative workshop
- Ice Breaker instructions with questions at the Preparation stage and scenario with the design task at the Incubation stage

Additional material

- DVD with ambient music (soundtrack from the French film *Amelie*), which was played at gathering time before the actual start of the creative workshop

3.) Space

The first part of the study was completed individually at the participants' homes. The second part of the study was performed in the Interaction lab at City University London. The space for the creative workshop was not the most appropriate, as the participants were not able to move around freely. Unfortunately, there was no other space available at this time in the Centre for HCI Design.



Figure 29: Some of the materials that were used at the creative workshops.

5.2.4 PROCEDURE

The Pilot Study had the following stages:

a.) Recruitment

The process began with recruitment, which was an important part of Study 3, which started 1 month before the pilot study began. The older participants were recruited from the HSS Centre in November 2008 using several different media:

- two Power Point presentations in the HSS Centre
- printed leaflets
- advertisement on the HSS web site
- adverts at Islington Library (London) (see Appendix 7).

Recruitment of the older people started in November 2008 with two presentations at the HSS Centre, which was conducted on 15th of January 2009. At the talk it was explained to participants why this study was important, the stages and the content of the research, and how participants could contribute and improve the current situation (design better products for the older population). It was also explained how the collected data would be treated, how participants could get involved and what their reward would be. The audience had the opportunity to ask additional questions and put their name on the list. At the end of both presentations 12 people signed up to take part. After that, a smaller meeting was organized where four people received the Cultural Probes to start work on.

b.) The preparation stage with the Cultural Probes method

The Cultural Probes were delivered to participants approximately one month before the creative workshop. The participants worked on this study individually at home and they spent approximately 20-minutes per day to complete the required tasks. They completed the Probes in their own time, preferably whenever they used a computer. Participants usually needed between 10 and 14 days to complete the Cultural Probes.

Regular Monday afternoon meetings were organized during the study at the HSS Centre with the intention of monitoring their progress and helping participants where problems occurred. Participants were also able to get additional help via landline or mobile phone.

c.) Interview

After the participants completed the Probes, they were invited to a short interview where they had an opportunity to explain their answers and share their experiences of this part of the study with the facilitator. They were asked to comment on the Cultural Probes, provide details on the mind map, and explain which part of the study they found the most difficult or pleasurable. After the interview, the creative workshop followed within one week.

d.) The Creative Workshop with the applied Poincaré creative process

The second part of the study contained group activities in which participants got the opportunity to meet and be involved in creative activities. The four-stage Poincaré and Wallas creative process was applied throughout the creative workshop. The stages were as follows (see Table 10):

- The preparation stage

On 15th of January the participants started gathering together at 9:30 AM; the main purpose of starting early was to mentally prepare participants for the creative activities. The soundtrack from French film *Amelie* was played for the duration of the reception and they soon started to chat informally. The creative workshop began with a Power Point presentation, which provided shared instructions to participants throughout the workshop.

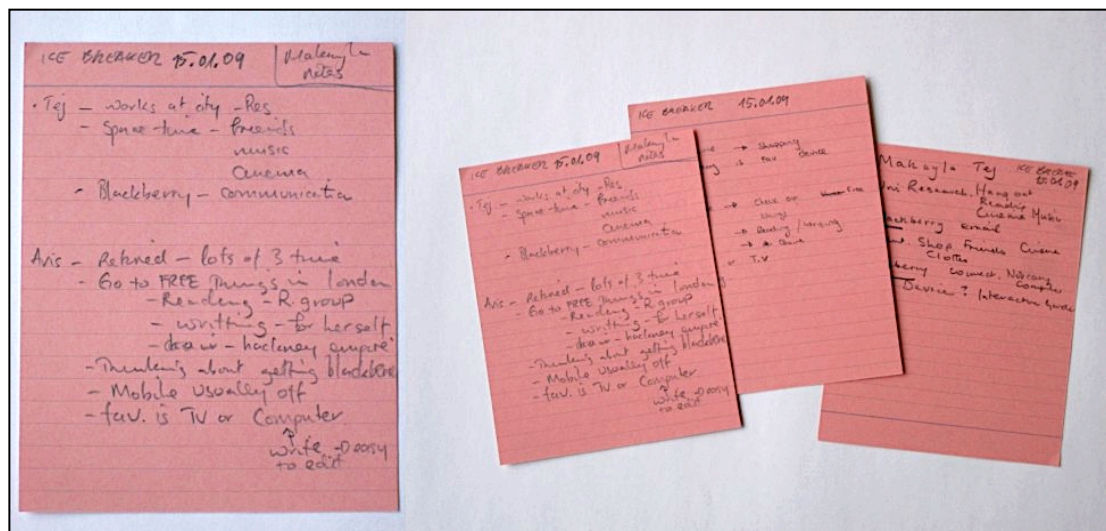


Figure 30: Ice breaker notes: participants' notes from the ice breaker session.

Firstly, the purpose and content of the creative workshop was explained to participants and an Ice Breaker exercise was used to help the group get to know each other. In this exercise participants had to ask each other three questions about leisure activities, their favourite IT device and their most pleasurable experience with this device. Participants made notes on the cards provided (see Figure 30).

- **The incubation stage**

In the incubation section, participants were shown an example of future design for older people (the multimedia presentation of the MA thesis with the title “Interactive Garden”). The purpose of this presentation was to stimulate the participants’ creativity. After the presentation, possible mental blocks that the participants needed to avoid were discussed. The brainstorming session was then started, and the participants were given the following scenario:

*You are a designer in a company named IDEA. IDEA have been given the task of designing a device for a company called GLOBAL DIGITAL, who produce various devices, tools and products for different European countries. You have been asked to design **a new digital device that will address senior citizens’ everyday needs.***

The participants received verbal, written (prints) and visual (displayed on the wall over the Power Point presentation) instructions to help them fully understand what was required of them. To help discover new ideas and create different connections they were given the creative triggers (45 Creative Cards) to help them think of new ideas and create different connections. Support for illumination involved the use of brainstorming around five key questions, which were written on five blank notepads and attached to the wall. The questions were the following:

- *What would this device do?*
- *When will the device be used?*
- *Where will the device be used?*
- *How will the device be used?*
- *Anything else?*

The participants were given all the cards at the same time. Participants were able to add their own comments, ideas or thoughts on the blank cards. Cards with ideas were attached to blank notepads under the relevant questions.

After 50 minutes, when participants had had a chance to answer the five questions, they were asked to vote for the “Golden Idea”. This was the idea that in their opinion satisfied older people’s needs in the most appropriate way. The participants got stickers (in the shape of stars and in gold), which they were able to paste under each selected idea. An idea could get a maximum of five stars. In this way all the members of the creative workshop had an equal opportunity to give their voice.

A one-hour lunch break followed at 12:00, which was taken outside of the Interaction Lab where the creative engagement was held. During that time we had a pleasant informal conversation in the HCID communal area.

- **The illumination stage**

After the break we continued with the Illumination stage, where the participants were required to develop the idea they had voted for to make it more tangible. At this stage the participants were asked to develop and verify their ideas in three different ways: either visually - ‘Draw it’, using storyboarding techniques, drawings, and sketches; ‘Make it’ by assembling a concrete prototype using materials from a ‘Magic box’; or verbally ‘Tell it’ by recording an oral description or a written concept definition. The participants were presented with examples of sketches and prototypes to help them with the process and to provide a clearer idea of what was expected of them. The participants decided to employ all three methods simultaneously. After one hour the participants had to present and describe their paper prototype, which was their final output, to the facilitator. They were requested to deliver the name of the device, situations where the device would be used and described the materials.

- **The verification stage**

Finally, participants were given a questionnaire and asked firstly to evaluate the novelty, appropriateness and reliability of the creative prototype, and secondly, to provide qualitative feedback on the facilitation process and skill of the facilitator (see Appendix 10).

5.3 RESULTS

The following three objectives were explored:

- i.) to develop understandable and uncomplicated methods for measuring qualitative data during the creative process
- ii.) to investigate potential phenomena that could be assessed during the creative process
- iii.) to identify the most appropriate approach for assessing the final output.

5.3.1 ANALYSIS OF THE CREATIVE PROCESS

a.) Existing methods for analysing data and definitions of the assessed phenomena

As noted in the literature review, creativity is usually measured statistically by various psychological tests. The most well-known test is the Torrance Test of Creative Thinking, which is based on Guilford's (1959) definition of four creative factors: *flexibility, fluency, originality and elaboration*. Therefore, it was decided to apply Guilford's four creative factors based on the original definitions (see Table 11) to measure creativity during the creative process. It was also decided, based on the observations from Study 2, to measure factors that stimulate and inhibit creativity during the creative process in order to verify the success of the creative engagement.

b.) Procedure: Graphical analysis of qualitative data and code scheme

In order to test a graphical approach to analysing the data, discussions from the incubation and illumination stages were transcribed into Microsoft Word. During the transcribing process both video and audio data were watched for a more precise record, as well as seeking to identify what was happening throughout the creative workshop. Alongside this procedure, comments relating to the creative process (for example, participants' problems with understanding the purpose of the Creative Cards, older people's practical constraints) and participants' behaviour (for example, gestures, laughing, and choice of certain material) were included. Below an example of a description is provided (see Appendix 10):

F1 is explaining what ideas relate to the question "What will this device do?" OP1 takes a seat. F2 suggests that participants use golden stars to prioritize their ideas. Participants are marking their ideas with golden stars. OP1 is voting for the last one.

In order to make graphical analysis easier, the transcribed text was copied into Excel tables afterwards. The transcription was then divided into chunks of text depending on topic that the participants discussed (the definition of topic will be explained in more detail in the next chapter). After this, through careful reading, Guilford's four creative factors (see Table 11), factors that stimulated participants' ideas (see Table 12) (for example, Creative Cards, life experiences or existing technology), and factors that inhibited ideas (see Table 13) (for example, confusion with applying Creative Cards) were identified. Next, visual symbols were designed for all identified phenomena. As shown in Table 11, each phenomenon was firstly represented by its visual symbol (column 1), then named (column 2), linked to Guilford's definition of creative factors (column 3), and at the end illustrated with an example from the transcribed text (column 4). In order to demonstrate the proposed approach the first 15 topics of the incubation and the illumination stage were analysed in this way (see Appendix 10).





Visual symbol	Name of symbol	Guilford's definition of creative factors	An example of the creative factor OP - Older person F - Facilitator D - Designer
	Flexibility	Flexibility produces a wide variety of ideas.	F: When will this device be used? OP: When you need it? F: When? IN A DANGER? OP: IN A KITCHEN to clean my oven. (laugh) F: Where? OP: ON A TRAIN. On a train you will need to get certain information to transfer to another train station. D: So, maybe to use IN THE CAR as well.
	Fluency	Fluency is the ability to produce many ideas.	OP: You can take it when you fall down outside. You can call and an ambulance will come. Someone will calm you down or sit you down. Yes. If you can just talk to someone you will feel better, while you get up.
	Originality	Originality is producing novel ideas.	OP: Tell the oven that it needs to be clean.
	Elaboration	Elaboration is adding value to existing ideas.	D: Maybe that padding can be slightly soft, maybe something like that; it will protect itself, but it won't help you.

Table 11: The table represents Guilford's definition of creative factors that were measured during the incubation and the illumination stages.








Visual symbol for stimulus	Name of stimulus	Description of stimulus	An example of stimuli OP - Older person D - Designer
Stimuli at Preparation stage			
 S _{CP}	Stimulus from Cultural Probes	When participant mentioned part (questionnaire) of Cultural Probes	D: I don't think that it will be like a brick. OP: To break a window.
 S _{MM}	Stimulus from Mind Map	Idea is stimulated by Mind Map	D: Ok. I said ORGANIZE, and I put down in my Mind Map why I like my Blackberry, because I can organize things. Maybe ORGANIZE.
 S _P	Stimulus from presentation	When participants' idea is stimulated by watching presentation called "Interaction Garden"	OP: Yes, the carrot where that voice was, if it was this (device) digital it would just give you reading.
Stimulus at Incubation stage			
 S _{CC}	Stimulus from Creative Cards	When participant mentioned name of a certain card and after that followed idea	OP: Maybe it can CONNECT you with the people.
Stimulus at Illumination stage			
 S _M	Stimulus from materials	When participants' idea is stimulated by experience with materials	OP: That is a chain or something... What material do you want to make it out of? You don't want a chain around your neck do you? A ribbon or some nylon...ester.
Other stimuli			
 S _T	Stimulus from technology	Idea is stimulated from any kind of technology: past, present or future	D: If the device will be flat like an iPhone.
 S _{LE}	Stimulus from life experiences	idea is stimulated from participants' life experiences	OP: Maybe some kind of robot for cleaning the oven. Do you know they have these robotic hoovers; maybe you can get one for the oven?

Table 12: The table above shows a visual representation of the stimulus, the name of the stimulus, its descriptions and a practical example of the stimulus.






Visual symbol for factor that inhibited creativity	Name of factor	Description of factor	An example of factor OP - Older person D - Designer
	Confusion	When participant gets confused, because they do not know what to do.	D: Where would we start? Here? What will the device do?
	Not familiar with the technology	When participant does not have experiences with certain technology (e.g. wireless).	OP: WIRELESS. Why wireless?
	Not familiar with the terminology	When participant does not have experience with certain terminology (e.g. digital).	OP: I'm looking at the DIGITAL card, but I know that digital could be...
	Physical disabilities	When person needs to sit, because they are tired.	/
	Facilitator	When facilitator delivers ideas during the creative process.	/

Table 13: The visual representation of factors that inhibited creativity, their names, descriptions and an example for each of them.

c.) Results

The phenomena were counted and inserted in tables for each set separately; the results are presented in the three tables below.

- Measuring creativity according to Guilford

In total this group produced 51 instances of creativity (flexibility, fluency, originality and elaboration) (see Table 14) in the first 15 topics at both stages of the creative process; however, altogether 40 instances were developed in the illumination stage in comparison with the incubation stage where only 11 instances were developed. The reason for this significant difference might be the fact that participants were not familiar with each other and their misunderstanding of how to use the Creative Cards.





Measuring creativity according Guilford				
Symbol	Explanation of the symbol	Incubation stage	Illumination stage	Total
	Flexibility - variety of ideas	1	8	9
	Fluency - many ideas	5	3	8
	Originality - novel ideas - situated creativity	1	/	1
	Elaboration - add value to existing ideas	4	29	33
		11	40	51

Table 14: The total number of ideas according Guilford's four creative factors in the first 15 topics of the incubation and the illumination stage that were analysed.

- Factors that stimulated creativity

Since the incubation stage was based on the Creative Cards, more stimuli from cards were identified in this phase. However, in the illumination stage most factors that stimulated creativity were from the applied materials that participants used in building a paper prototype, life experiences that participants uttered and experiences with technology (see Table 15).








Factors that stimulate creativity				
Symbol	Explanation of the symbol	Incubation stage	Illumination stage	Total
Stimuli at Preparation stage				
 CP	Stimulus from Cultural Probes	/	1	1
 MM	Stimulus from Mind Map	1	/	1
 P	Stimulus from presentation	1	/	1
Stimulus at Incubation stage				
 CC	Stimulus from Creative Cards	18	/	18
Stimulus at Illumination stage				
 M	Stimulus from materials – ‘Magic box’	/	11	11
Other stimuli				
 LE	Stimulus from life experiences	5	12	17
 T	Stimulus from technology	7	10	17
Total number of stimuli		32	34	65

Table 15: The total number of factors that stimulated creativity in the incubation and illumination stage.

- Factors that inhibited creativity

In total 25 factors that inhibited creativity were identified in the incubation stage alone. The highest number of blocks (16) were caused by both facilitators who were giving instructions about the purpose of Creative Cards, then interfering or asking additional questions to encourage participants to deliver new ideas, or explaining what would happen next. However, none of factors that inhibited participants’ creativity at the illumination stage were identified (see Table 16).






Factors that inhibit creativity				
Symbol	Explanation of the symbol	Incubation stage	Illumination stage	Total
	Confusion	3	/	3
	Not familiar with technology	2	/	2
	Not familiar with terminology	2	/	2
	Practical constraints	2	/	2
	Facilitator	16	/	16
Total number of blocks		25	/	25

Table 16: The total number of all creative blocks which were identified in the incubation stage.

5.3.2 ANALYSING CREATIVE OUTPUT

The final output of the creative process was a paper prototype, which participants named *Saviour*. *Saviour* is a device that older users can wear around the neck; it is able to send three different messages, depending on how serious the danger (situation) the user is in. The owner could request help by activating three different buttons: green, yellow and red. If the user is in serious danger, for example, of falling down, they can call the doctor by pressing the red button. The device was designed to be unobtrusive and to look like a piece of jewellery (see Figure 31).



Figure 31 (from left to right): The creative output of the pilot study: the paper prototype of the device called Saviour (left); older user wearing the device (middle); activating the Saviour (right).

a.) Existing methods for analysing data and definitions of the assessed phenomena

Amabile (cited in Feldhusen and Goh, 1995), and Boden (1996) insisted on the importance of the testing of final creative output by external experts. Jones et al. (2008) suggest questionnaires, where participants are asked to evaluate creative output based on Sternberg and Lubart's (1999:3) definition of creativity, that creativity is: *"the ability to produce work that is both novel (i.e. original, unexpected) and appropriate (i.e. useful, adaptive concerning task constraints)"*. The questionnaire was applied based on the literature review, where participants were asked three questions relating to novelty, usefulness and how the product will fit in an older person's life.

b.) Procedure: Questionnaires

In the verification stage a questionnaire was adopted for measuring the final creative output (see Figure 31). The applied survey had two parts: in the first part the participants were required to evaluate the four stages of the creative process and the facilitation of the creative workshop. In the second part the participants were asked the following three questions (see Appendix 9):

- *How new, surprising or exciting do you think this idea is?*
- *How appropriate or valuable do you think this idea is?*
- *How well would the idea (device) fit in your life?*

The participants were able to express their opinion with use of the Likert scale, with marks from 1 to 5:

1	2	3	4	5
Not at all new				Very new
Not at all appropriate				Very useful
Will not fit at all				Very well

c.) Results

In general all three participants were positive about the facilitation of the creative workshop. Only the designers had some comments on the incubation stage, which was in their opinion slightly confusing at the beginning because of unclear instructions. They suggested that it would be necessary in the next study to firstly discuss the purpose of the device, and then where, when and how the device would be used.

The participants were overall very positive about their paper prototype. Thus, under the first question (*How new, surprising or exciting do you think this idea is?*) all three participants scored their idea with 4. Both designers highlighted the simplicity of use of the device with it providing only necessary information. Furthermore, a designer and an older person scored the usefulness of the *Saviour* with the highest score; in their opinion the device can provide confidence and independence to the older person especially when person is outside of their home. The second designer scored usefulness and the device fitting in someone's life very high with 4. However, the other designer and older person scored the device with the highest score for fitting in older people's lives. The older person was convinced that this device "*will be welcome to order people's life*".

5.4 DISCUSSION

5.4.1 LESSONS LEARNT ABOUT PROPOSED DESIGN PROCESS AND CREATIVE METHODS

Introducing the study to potential participants before recruitment is vital. At the recruitment stage it is necessary to employ a higher number of the participants, since a certain number of people will drop out. The reasons were not investigated in more detail, but it was

assumed that illness, being uncomfortable in group participation, the unknown location of the creative workshop or time limitations, could be potential reasons for dropping out.

- **The Cultural Probes**

During the Cultural Probes session the following issues were noticed: firstly, to fulfil the Cultural Probes the participants needed on average between 10 and 14 days regardless of whether the participant was a designer or an older person. Secondly, some of the participants found the Diary Booklet relatively boring; they were expecting more variety of tasks, similar to those in the Workbook. Finally, regular meetings with participants, monitoring, and clarity of instructions and tasks were necessary.

- **The Creative Workshop**

The instructions need to be as clear and simple as possible during the creative workshop. For example, as a consequence of unclear instructions, participants at the brainstorming session were confused regarding how they could apply Creative Cards and were not certain how to start the task.

On the other hand the facilitators sometimes greatly inhibited creativity during the incubation stage by clarifying instructions, giving directions, stimulating their ideas with additional questions and so on. Therefore, the facilitator needs to deliver clear instructions at the beginning of the session and then not interrupt the participants from then on.

The mixed group (composed of two designers and an older person) collaborated very well together throughout the entire creative workshop. It was expected that because of the inequality in the group that the designers might “drown out” the older person. However, this did not happen since the participants needed to design a digital device for older people, and the designers were compelled to consider the older person’s opinion.

It was expected that participants would favour only one way to express their idea; however, participants used all three possibilities (*‘Tell me’*, *‘Draw it’*, and *‘Make it’*). The roles inside the group were divided during the creative process, so one was writing, another participant was drawing, and the third person was building the model.

- **Apparatus and recording data setting**

The Interaction Lab was not the most appropriate place for conducting the creative workshops: for example, the tables were unsuitable and there was not enough space. Therefore, it will be necessary in future to ensure that the space for conducting creative engagement will be more appropriate for this type of activity. In addition, the pilot study identified the importance of the additional assistant, who will only concentrate on recording data.

5.4.2 LESSONS LEARNT ON ANALYSING DATA IN PILOT STUDY

The following lessons were learned from the pilot study: firstly, transcribing conversations was time-consuming because of the huge amount of material, and in certain places the recording was not clear. Then, because three individuals were involved in the conversation, it was difficult to identify who said what. As well, by only analysing transcriptions it was impossible to identify what exactly was happening during the design process; for example, how the participants were building the prototype. In addition, sketches, worksheets and photos of the prototype in this way of analysing data were not included. Because in the illumination stage the highest amount of topics and no blocks were identified, it was decided to concentrate on analysing data from this stage only. As a result of the parameters that were measured in the pilot study, the following findings should be presented:

- **Measuring creativity**

Guilford's four factors (1959), measured by counting verbs in sentences, require transcription of all audio data. Because of the huge amount of data, this was very time-consuming. Therefore a method was required that would allow a lighter and quicker approach in order to get results more easily, but not with limited quality.

- **Factors which stimulated and inhibited creativity**

More research had to be done on a literature review to support identification of factors that stimulate and block creative ideas.

- **Measuring creative output**

The questionnaires may not have been the most appropriate way to evaluate the final creative output, since the participants scored their ideas very highly. Therefore, it may be necessary to ask for the opinion of an independent expert.

After learning from these mistakes and problems, it was necessary to develop an approach that: i.) would require less time when analysing data; ii.) would include video and audio material, together with artefacts in the analysis to allow a complex representation of activities during the creative process; iii.) would present the complexity of design process with qualitative and quantitative data and iv.) would include participants' verbal and hands-on activities.

5.4.3 SUGGESTIONS FOR FUTURE WORK

- It is important to recruit more people than appear to be necessary, as some will certainly drop out.
- The Cultural Probes were an appropriate creative method, although constant support was required.
- The creative process was in general appropriate, although smaller changes needed to be implemented, especially in terms of delivering clearer instructions, the appropriateness of the space and employing an additional assistant.
- For analysing data during the creative process there was a need to adopt methods that are simple to use for a large amount of data, since the transcribing process was too time-consuming.
- Since the highest number of creative statements were identified in the illumination stage, it may be important to concentrate more on analysing data from this part of the creative process.
- More research needed to be done on a literature review to support the identification of factors which stimulate and block creative ideas.
- Specialists needed to be employed from the area to evaluate the final creative output.

5.5 CONCLUSION

Based on the pilot study the proposed content of the creative engagement in the main study is appropriate, although some changes need to be made in terms of more accurately delivering instructions, appropriateness of the space for the workshop and providing an additional assistant. However, in the main study, more work on a literature review that will investigate procedures for analysing data and factors that stimulated and inhibited creativity is required. Also, more time needs to be spent on investigating a more efficient approach to analysing the vast amount of data recorded.

6 METHODOLOGY: APPLIED METHODS AND DATA ANALYSIS

6.1 INTRODUCTION

The aim of this chapter is to discuss the methods adopted in the creative design process and explain the decisions made concerning how to analyse the data. This chapter consists of two main sections: i.) the applied methods that were adopted in the design process, and ii.) the rationale behind the decision for the data analysis procedure.

The first section will discuss the original Cultural Probes, paper- and technology-driven probes and the author's design of this method. Then, other researchers' creative workshop content will be presented and a step by step description will be given of the way in which ideas from these were implemented in Study 3. This will include a description of the two new methods developed by the author, involving the use of Creative Cards, and worksheets to implement the 'Tell me, Draw it and Make it' group of approaches and the 'Magic box'. The questionnaires adopted in the last two stages of the creative design process will also be described.

The second section will focus on the measurement of creativity during the design process as well as creative outputs. Approaches of other authors will be reviewed, and lessons learned from the pilot study will be presented. The parameters chosen for measuring creativity in the design process include: i.) flexibility (with topics), ii.) flow (with turns), and iii.) factors that stimulate and inhibit creativity. Finally, the procedure for analysing qualitative data and the final output will be given.

6.2 APPLIED METHODS

In this section the methods applied in the main study will be discussed: Cultural Probes, the Creative Workshop, Creative Cards, worksheets, the 'Magic Box' and questionnaires. Firstly, the listed methods will be discussed in terms of other researchers' approaches and adoption, and then how the author applied these methods.

6.2.1 CULTURAL PROBES

Cultural Probes is the method which is arguably the most frequently adopted with older people. This part will focus on the Cultural Probes content. Firstly, how Bill Gaver designed the Cultural Probes package will be discussed, and then how other researchers further applied and developed this method.

6.2.1.1 ORIGINAL APPROACH

For collecting rich quantitative data Gaver's et al. (1999:22-24) original Cultural Probes had the following content:

- **eight to ten postcards** with images on the front and questions on the back (for example, tell me about your favourite device). With postcards Gaver intended to ask questions in more informal way (see Figure 32, middle).
- **seven maps** with small red dot stickers. Researchers used maps to explore older peoples' attitude towards their environment. For example, which places in the world the participants visited, then on a local map places where they went to meet people, or imagine that the participants' small village in Italy was New York. At the end of the completed task the maps were sent to researchers (see Figure 32, left).
- **Disposable camera**, which was redesigned in order to fit the other Probes' material. Participants were requested to take photos of their home, clothes that they were wearing at that moment and so on.
- **Photo album**, which was in the form of a small booklet where participants were requested to take up to 10 photos to tell the story of their lives.
- **Media diary** where participants were requested to record their use of TV and radio for one week; for example, what they watched, with whom and when. In addition, they had to record telephone calls, and their relationship with the person who called.



Figure 32 (from left hand side): The Cultural Probes used for the Presence project: the original Cultural Probes package (left), postcard (middle) and returned map where participants marked safe and dangerous places in Bijlmer (right) (Gaver et al., 1999).



Figure 33: The Domestic Probes contained a disposable camera with requests, ‘dream recorder’, ‘listening glass’ and friends and family map among others.

6.2.1.2 OTHER USES OF CULTURAL PROBES

After Gaver’s first implementation in 1999, others (Lucero and Mattelmäki, 2007; Sotamaa et.al., 2005; Hutchinson et al., 2003; Van der Lugt and Sleeswijk Visser, 2005; Crabtree et al., 2003; Mattelmäki, 2003; Mattelmäki and Battarbee, 2002; Hulkko et al., 2004; Graham et al., 2005) redesigned and transformed Gaver’s version, depending on the needs and aims of their research. However, some of them used paper-based methods, and others transformed their approach with the use of digital technology, where participants adapted mobile phones for self-documentation.

Graham et al., (2005) used Cultural Probes in investigating the use of visual information message exchange in hospital care, where staff cared for recovering mental patients. Through the adoption of probes, researchers aimed to investigate current practice and the use of technology at work. The probes consisted of a booklet, a Polaroid and a disposable camera, sticky notes, glue and a pen (Graham et al., 2005). The booklet was made up of three parts: i.) **“Photo Diary”** to record the hospital’s environment, ii.) **“Message book”** to reflect on delivering information among employees, and iii.) **“Ideas Book”** for recording new ideas on existing approaches that could be improved with use of technology. Graham et.al. (2005) reported on conducting an interview after the probes were completed.

Mattelmäki and Battarbee (2002) adopted *empathy probes* to investigate the health and wellbeing of by-pass operation patients for a Finnish heart-rate monitor producer. Before participants started

with the study they received a flower to take care of; the flower informally reminded them to carry on the study. The kit included: i.) **Diary** (with stickers) for recording daily habits, thoughts about health, welfare and exercising habits, ii.) **Disposable camera** with a list of photos required from participants²² (for example, a photo of something ugly), and iii.) **10 cards** with open questions related to participants' interests for heart rate monitor development. Other cards included facts or were related to experiences and emotions. After the study Mattelmäki and Battarbee (2002) ran interviews with the participants in order to validate preliminary results, and to give participants an opportunity to explain their materials. Finally, participants had to design a collage where they presented their ideal 'exercising assistant'. Material for this exercise included cut-out pictures and words from magazines. Mattelmäki (2003) adopted similar probe content for collecting data about older individuals. With the collage, participants were required to design an "ideal aging place"; collected material was later used in the workshop.

Lucero and Mattelmäki (2007) applied probes in a professional environment to better understand users and to investigate new ideas for design. The Lucero and Mattelmäki (ibid) probes included a '**Design Studio**' diary with: i.) **Timeline** for recording participants' daily thoughts and actions, ii.) **Open questions** to stimulate participants to tell their stories and express their opinions, iii.) **Map** for self-expression, and iv.) '**Ideal Design Studio**' a drawing exercise to investigate the visions and wishes of industrial designers, and v.) **Disposable camera** with a 'Picture Record Table' for participants to research their environment and to visually express what they felt while they were working on the probes. Because participants' complaints about the amount of writing, later on Lucero and Mattelmäki (2007) encouraged them to use camera phones, sending SMSs in order to report their experiences. Therefore, Lucero and Mattelmäki (ibid) suggest the following considerations: i.) to save participants' time, researchers could use cameras and dictaphones instead of diaries; ii.) for easier recording of data, employ material that is visually appealing; iii.) for more understanding about the nature of the study, designers have to be adequately informed; iv.) allowing designers to work in a way that suits them the most, therefore the probes have to be flexible and permit designers to use different strategies; and v.) motivate designers to participate with a unique design adopted specially for the study, and using handmade probe material.

Crabtree et al. (2003) reports on the use of the Cultural Probes approach with previous psychiatric patients living in residential care, older people and people with disabilities living at home, aiming to develop computer support for those groups. Crabtree et al. (ibid) investigates the adoption of this

²² This self-capturing is appropriate in situations where researcher cannot be present Lucero and Mattelmäki (2007).

method in environments that could be problematic for use of other ethnographical approaches, such as observation. Crabtree et al. (2003) used probes with the following items: i.) **Question postcards** linked to participants' worries, interests and ideas; ii.) **Maps** to mark their environmental routine and places where they felt insecure; iii.) **Camera** to take photos of people important to them (friends, visitors) or things that bored them; iv.) **Photo albums** to assemble the story of their life; v.) **Media diary** to record various media that they were using, when they used them, where they used them and with whom; vi.) **Dictaphone** to record participants' daily activities, ideas and beliefs, vii.) **Visitors' book** to take notes on the participants' social life; and viii.) **Scrapbook**, with sticky notes, pencils and crayons to draw their home. The items were delivered to participants as Christmas presents, accompanied by instructions and suggestions on how to use the material. Crabtree et al. (2003) reported problems with analysing collected material, such as photos, booklets and diaries. However, they noted the importance of Cultural Probes as creative triggers which transformed participants into active enquirers, rather than passive subjects.

Van der Lugt and Sleeswijk Visser (2005) established probe kits based on design tasks (e.g. design an intuitive alarm clock) and participants' characteristics. The following items were included in their package:

- **A Polaroid i-zone camera** to take photos of items that appealed to participants for particular reasons in their natural environments and about which the participants had to write a comment.
- **Workbook** with open-ended questions and a request to draw, for example, things that they did while they were travelling to work. Small stickers were added for expressing feelings and thoughts.
- **Diary** to draw or write something about the design task each day.
- **Sound recorder** to record the alarms of their clocks and sounds that participants liked or disliked.
- Pre-stamped **Postcards** that were sent to participants before the session with a question or task.

Several researchers replaced traditional ethnographic approaches with digital ones, such as mobile probes, where mobile technology is applied. Regarding Masten and Plowman (2003, cited in Hulkko et al., 2004) suggested these technologies could be PDA's, emails, mobile phones, pagers, digital cameras and servers that collect, sort, share and create digital user databases. Hulkko et.al. (2004) applied this approach in creating new sales points for clothing stores and in the development of

mass customised products, services and applications. In this study the author applied mobile probes, using a mobile phone with a GPRS connection and a digital camera. A newly-developed system was applied for sharing and storing data based on Java software that allowed devices to exchange data, PHP scripting to send and edit questions, and viewed results through a web server.

Hutchinson et al., (2003) describe the use of a *messageProbe* and *videoProbe* in the process of co-designing technologies with various families in France, Sweden and USA. With these probes, Hutchinson et al., (ibid) investigated users' needs and desires, tested technologies and aimed to inspire users and designers to think about future technology. The *messageProbe* is an application that enables family members to communicate over post-it-notes in a zoomable space. Two or three family members were able to write or draw at the same time from different locations or at different times, and members could check others' notes from different locations. Members only used a writable LCD tablet display or a regular graphic tablet, and a monitor and a pen. The *videoProbe* enabled the sharing of images among family members living in different households. A video camera was used to take snapshots; photos were then stored and made available to everyone in the network. Family members were able to browse photos with remote control; after a time the photos disappeared, and that encouraged people to take new ones. *VideoProbe* was compounded from an Apple Cube, an LCD tablet, a USB camera, speakers and a hub, a remote control and an Apple Airport base for wireless networking.

After their introduction, Cultural Probes were transformed into various forms in order to more efficiently collect rich qualitative data, and being easier to use for the participants. Probes were redesigned, based on the aim and purpose of the study. Some researchers therefore kept probes in paper form, while others transformed them with the incorporation of information technology. However, the Cultural Probes described in the next section remained in paper form for use with the older population, who are not very familiar with current technology.

6.2.1.3 DESIGN OF CULTURAL PROBES FOR STUDY 3

The adoption of the Cultural Probes in the preparation stage aimed to:

- i.) stimulate older people and designers to think how they use technology, for example computers²³
- ii.) introduce methods to participants that would be applied later on in the creative workshop

²³ Computers were chosen as both groups of users were using them; in contrast, it would be more problematic if mobile phones were selected, as there would be more diversity in the use of this technology.

iii.) mentally prepare participants for the second part of the study – the creative workshop.

Therefore, probes were compounded from the following areas: i.) the participants' operational and family background; ii.) the participants' use of technology; iii.) their computer learning experiences and workplace; iv.) their use of computers and wishes for the future; v.) emotions and feelings in different situations while the participants were utilizing computers; vi.) a critique of existing software and hardware computer technology; vii.) their relationship with a computer (diary); and viii.) the participants' day-to-day use of a computer.

Adopted probes were designed in a way that suited the study itself and both groups of participants: older people and designers. They were therefore visually appealing, interesting, and attractive to both groups of participants. They had various humorous aspects (e.g. jokes about computers and their users); coloured paper was used, although probes were printed in black and white. Because both groups received the same set, the font size was at least 14 pt. Special care was taken in giving simple and clear instructions and to provide additional help where necessary.



Figure 34 (from left hand side): The author's Cultural Probes (left). Probes contained a workbook, a diary, stickers, a postcard and a disposable camera (middle). And, one of the pages in the Workbook and Instructions booklet (right).

Cultural Probes set consisted of: i.) Workbook with instructions, where users annotated their use of computers and other technology; ii.) Diary booklet where their use of computers on a day-to-day basis was recorded; iii.) Disposable camera for participants to illustrate their use of computers, and recording parts that they did not like on the computer; iv.) Welcome card, which personally addressed participants; and v.) Accessories, such as stickers, pencil, glue and blank A3 paper for making the mind map.

a.) The Workbook with Instructions

The purpose of the Workbook and Instructions booklet was to stimulate participants to consider how they use their computer on daily basis, and to introduce certain methods (stickers and the mind map with photos and key words) that will be adopted later on in the creative workshop. The Booklet contained an introduction part with instructions, followed by 23 questions divided into 7 parts, named by days. Parts were separated with coloured paper sheets with printed black and white comic stories relating to the use of computers. Graphical symbols were added to these pages to inform participants about the following: i.) time required to complete the work; ii.) tools needed to finish the tasks; iii.) number of questions in each section; and iv.) places where use of stickers or disposable camera would be required (see Figure 35, right).

The booklet began with the following information:

- **Introduction** which contained a personal statement, an explanation of the study and what was required from the participants
- **Instructions** which explained how to use the workbook, description of the graphical symbols, and the author's contact details
- **Explanatory Statement and Informed Consent Form** (Senate Research Ethics Committee, 2008) (see Appendix 3), which explained to the participants the content of the study and how the data would be stored.

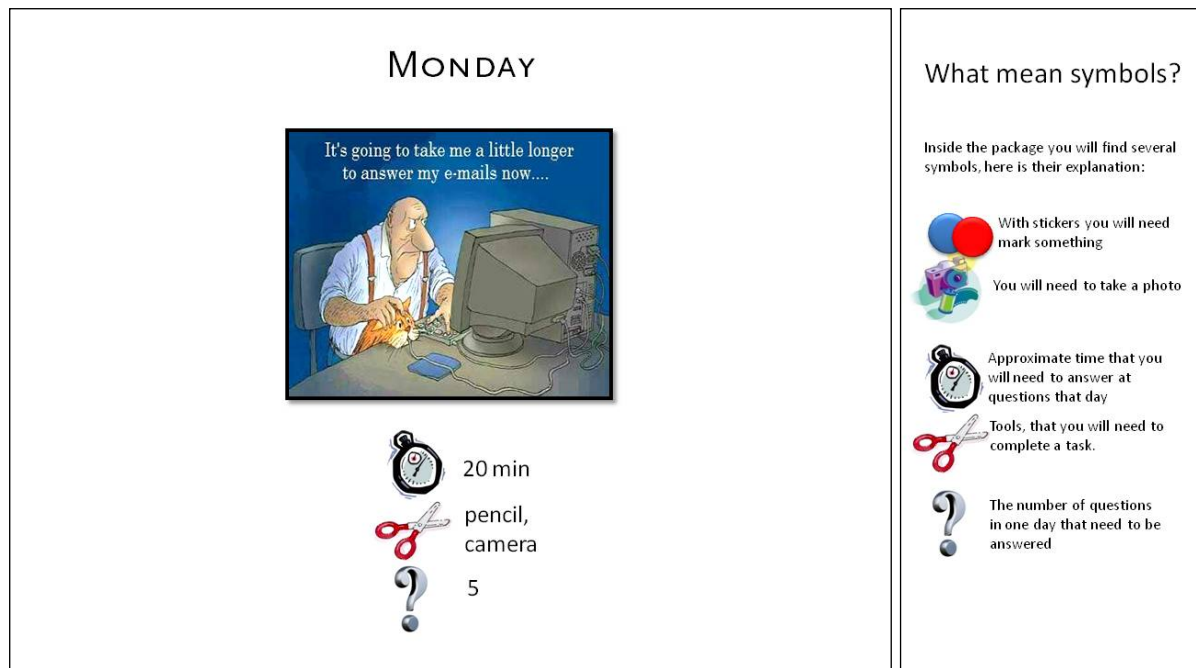


Figure 35 (from left hand side): Cultural Probes “daily” front page: each day participants were asked to answer a certain set of questions (left). Right is an explanation of the symbols: i.) clock symbol represented time required to complete the question(s); ii.) scissors, pencil, camera represented accessories needed to complete the task or answered the question(s), and iii.) question mark informed participants of the number of questions that were required.


The following paragraphs describe the seven subsequent parts of the workbook (named by days), and what participants had to do on each day.

1. Provide information about themselves (Monday)


Participants were asked to provide information about their family, education, professional background, and what computer they were using (see Figure 36).

1. Tell me something about


a.) your family members



b.) your education ...




c.) and your working experiences.




In my spare time I like to

2. Are you PC or laptop user?
(Please tick appropriate answer)



3. Are you PC or Mac user?
(Please tick appropriate answer)



4. Tell me why did you start to use a computer.....

5. Take a photo of your computer

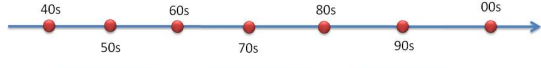
If you are using digital camera, please send me photos on helena.srstar1@city.ac.uk

Figure 36: Participant’s background and their use of technology: participants were asked to answer questions related to their background (left) and the technology that they use (right).

2. Say something about their use of technology (Tuesday)

Participants were requested to fill in *the technology timeline*, describing what kind of technology they were using during the day and indicate their favourite device using stickers (see Figure 37).

6. Timeline Write on lines when certain technology appears in your lifetime.



A. During the day I am using the following technology

B. Mark

1. What is your favourite device? (blue sticker)

2. When did you start to use a computer? (red sticker)

7. How old you have been when you start to use a computer?

Figure 37: Technology timeline: participants were asked to present what kind of technology they had used in the past 60 years.

3. Say who taught them how to use a computer and where they were using it (Wednesday)

In this section participants were asked to describe their computer experiences and preferences (for example, who taught them how to use a computer, provide photo of a person who taught them, and where else they would like to use a computer). In addition they were asked to describe and take a photo of their current working place (see Figure 38).

17. How are you feeling while you using a computer?
A. Tick all answers that apply.
B. In clouds write a situation when you filed like that.

creative

inspired

happy

disappointed

capable

old

young

sick

independent

connected

stress

in a company

winner

worry

situation

situation

situation

situation

situation

situation

situation

situation

situation

situation

situation

situation

situation

situation

situation

Please look over for more options

angry

collaborative

happy

disappointed

capable

old

young

sick

independent

connected

stress

in a company

winner

worry

situation

situation

situation

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situation

Figure 40: Participant's feelings while using a computer: participants were requested to report on how they felt in different situations (e.g. creative) while they were using a computer (left and right).

6. Critique computer software and hardware (Saturday)

In this segment participants were required to list parts of a computer that they liked or disliked and to mark them with the stickers. They were then requested to do the same with the software (see Figure 41).

20. What do you like or dislike at your PC? As a physical object (hardware).

A. Mark with blue sticker what you like the most.

B. Mark with red sticker what you do not like the most.

I like

What

Why

What

Why

What

Why

What

Why

I don't like

What

Why

What

Why

What

Why

What

Why

21. Which part of the software you like or dislike?

A. Mark with blue sticker what you like the most.

B. Mark with red sticker what you do not like the most.

I like

What

Why

What

Why

What

Why

What

Why

I don't like

What

Why

What

Why

What

Why

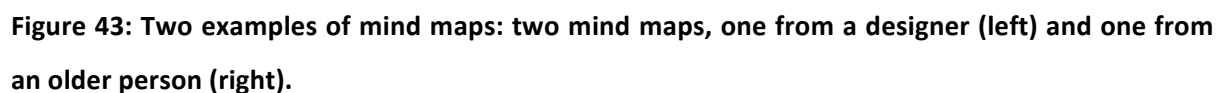
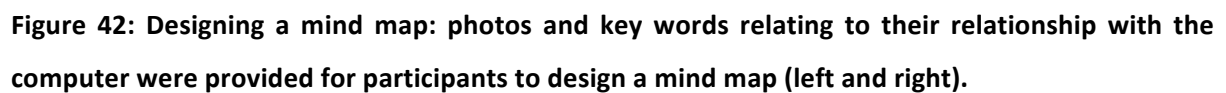
What

Why

Figure 41: Critique of existing computer software and hardware: participants were asked to express how satisfied they were with the computer (left) and software that they were using at that time (right).

On this page participants were firstly requested to list the elements of the computer that they liked or disliked. They were then asked to mark with stickers parts that they especially liked or disliked (see Figure 41).

The last question required them to present their relationship with a computer in the form of a mind map (see Figure 43). Participants chose key words and photos from a selection provided (see Figure 42).



b.) Diary

The main idea behind this booklet was to encourage participants to think how they used computers in everyday life. Therefore, the participants were required to annotate seven days of their experiences and feelings related to task accomplishment and answer the following questions: i.) when they used a computer; ii.) when, how and what tasks they completed on a computer; and iii.) what other technologies they used during the day. All worksheets followed the same pattern of questions (see figure 44).

Tell me what did you do today on your computer? Date: _____
Additional space for drawing, writing

A. Why did you want to do this?
B. When did you work on your computer?
C. How long did you work on computer?
D. How did you complete your task(s)?

E. How did you feel while you using the computer? (Where examples are provided on page 4.)

○ ○ ○

F. What other device(s) did you use today?

5

Figure 44: Typical diary question page: a question sheet that participants had to complete when they reported on how they were using a computer.

c.) **Accessories** provided as part of the cultural probes pack included the following.

- a **personal welcome card** for a more personal approach towards the participants (see Figure 45)

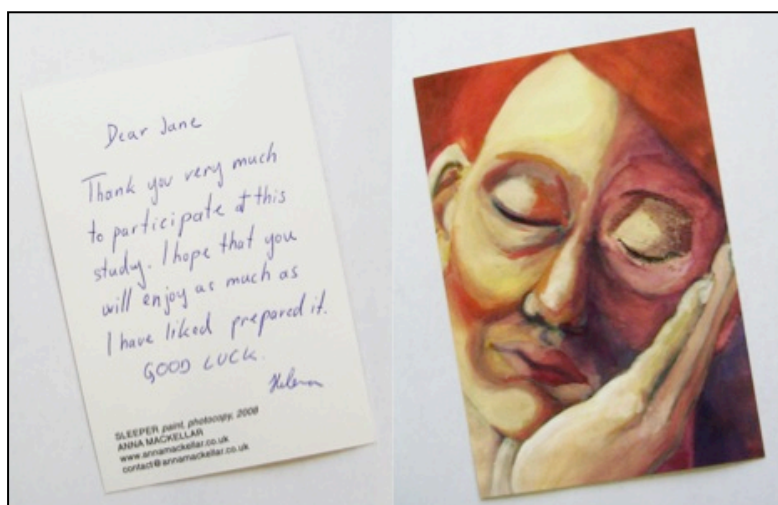


Figure 45: A welcome card: this was used in order to personalise the Cultural Probes set.

- a **disposable camera** with redesigned, rewritten and enlarged instructions for capturing visual data (see Figure 46). The use of a disposable camera was demonstrated to older participants.



Figure 46: Disposable camera with clear instructions. The author made sure that participants understood how to use the disposable camera.

The following items were added to the Cultural probes set:

- **stickers** for participants to mark, for example, their desirable technology or their preferred parts of a computer
- **glue and blank A3 format paper** for making the mind map
- **pencil.**

d.) Interview

When participants had completed the study they were required to conduct an interview where they had the opportunity to: i.) explain what they had done in the Cultural Probes study; ii.) establish a more personal relationship with the facilitator; and iii.) see the space where the creative workshop would be conducted. For the researcher, the interview was important in order to: i.) get information as to what the participant had done in the study; ii.) obtain some more details on the mind map; and iii.) get information on which part of the study participants had found the most difficult or pleasurable. The Cultural Probes method prepared participants for the second part of the study - creative workshops -which will be described in more detail in the next section.

6.2.2 CREATIVE WORKSHOPS

Firstly, creative workshops from other researchers will be discussed, followed by a detailed step-by-step guide to the author's own creative workshop.

6.2.2.1 OTHER USES OF CREATIVE WORKSHOPS

In this section, several different approaches to conducting workshops will be examined; there will be a special focus on the content of the creative workshops.

Maiden and Jones (2007) conducted a creative workshop for postgraduate recruitment and research marketing staff in order to get more ideas as to how to promote City University London and its courses. The workshop had the following content: in the preparation stage various examples of creativity (for example, a photo which showed storage for bicycles in Japan) were presented. Participants were then presented with definitions of creativity from other authors, and mental blocks (Roger von Oech 1983; Harper and Row 1986) that participants have to avoid during brainstorming were discussed. Afterwards, the goal of the workshop, the timetable for the creative engagement for the day, and the overview of the current situation that had to be changed were discussed. In the illumination stage the participants formed teams which had to present as many of their big ideas as possible, but with brainstorming constraints of 15 minutes. One idea was then required to be selected which participants had to work on for 40 minutes and record new ideas as well pros and cons for each. At the end of this session participants were required to report their ideas. After this, existing ideas were combined and placed on a storyboard and a few examples were shown to participants. Finally, storyboards were presented in 10-minute sessions where participants explained: i.) where the storyboard ideas came from; ii.) which ideas they combined; and iii.) where the storyboards might be applied. At the end of workshop participants were given questionnaires to fill in to evaluate the event. Later, Maiden and Jones (2007) documented results from the workshop. Sitorus and Kilbourn (2007) organized two-stage workshops²⁴ with the title *“Talking and thinking about skilled interaction in design”*. Applicants from a wide range of backgrounds, including ethnography, sociology, graphic and industrial design, performance and visual arts, and interactive design, attended in the workshop. The workshop was three-and-a-half hours long, with six people working in three groups. It explored how to research and design for skilled users by inviting designers to work towards developing a theoretical foundation and multiple perspectives for design (Sitorus and Kilbourn, 2007). The workshop had the following aims: i.) to bring together designers and researchers to share insights into and experiences of collecting, analysing and using material related to skilled practice; ii.) to present different representations of skills (visual, verbal, interactive) and share understanding about their applications in design; and iii.) identify common ingredients for skilful interaction.

²⁴ The author participated at this workshop as an active member.



Figure 47: “Video cards”: different video clips represented by video cards were used to stimulate participants in the design process.

Participants had to prepare up to 10 videos, from 30 seconds to 3 minutes long, where users demonstrated their skills. Each video needed to describe the quality of the skill required and design concepts or theories.



Figure 48: Visual and verbal stimuli: Key words and video clips were used to stimulate participants’ creativity in the first part of the workshop (left); on the left are some of the results from this session (right).

The first part of the workshop, called *“Opening the box”*, was in total 75 minutes long. Firstly, the participants and the videos that they brought with them were introduced (see Figure 50, frame 1). Then, participants watched videos and related them to “theories” by choosing two concept cards and creating a research question (see Figure 50, frame 2). After that they had to pick three videos that helped participants to answer the research questions.



Figure 49 (from left hand side): Materials used for the prototypes: various raw materials were used to build the final prototype (left and middle); right photo shows a model made by one of the group.

In the second *“Transforming the box”* part, which was 90 minutes long, participants were required make models based on their ideas; in their groups they had to build a model using materials from the box (see Figure 49, middle and Figure 50, Frame 3), and then present their model to other participants. After this they had to use a model from another group, and create a designed object that incorporated skilled interaction (see photo 50, Frame 4) and then present it.



Figure 50: The four-stage design process: participants watched videos (Frame 1); based on research questions participants choose two concept cards (Frame 2); participants built the paper prototype (Frame 3); participants took the model from another group and rebuilt it (Frame 4).

Jones et al. (2008) describe the creativity workshop that was used in a large research project with the aim of generating creative ideas and requirements for a work-integrated learning system. The two-day creative workshop was composed of several sessions where different methods to stimulate creativity were used. In each of four groups, four participants attended, including representatives of both technical and application partners from different organizations. On the first morning, activities started with an hour-and-a-half waking up session called a 'round-robin' where stakeholders were asked to produce one or two great ideas for the new system. The next two-hour session was designed to support *exploratory creativity*²⁵, by asking participants to work on creative triggers in order to generate new ideas for the project. The afternoon session focused on removing limitations,

²⁵ Exploratory creativity "involves the generation of novel ideas by the exploration of structured conceptual spaces". This often results in ideas that are not very novel, but unexpected (Boden, 1998: 348).

and so supported *transformational creativity*²⁶. This facilitated a brainstorming session resulting in the discovery of 35 limitations for the future system from all participants. After this, each group, in a three-hour session, worked on removing these limits (from seven to eight limitations per group) and how to improve the new system. The next day, in the morning participants had to listen to four different solutions for the system from the technology collaborators. Each participant had five minutes to adopt these triggers in order to stimulate new ideas. This session supported *combinational creativity*²⁷, which was important for “*the application of particular technologies with ideas about problems or needs as experienced by application partners*” (Jones et al., 2008). In the afternoon, the main focus was on storyboards (created based on case studies) and used many ideas as possible that were associated with case studies. Jones et al. (2008) concluded that the workshop was an efficient way to generate ideas for future system development.

De Jong et al. (2007) describe two consecutive idea-creation workshops, which were facilitated by an independent moderator, and where three designers were involved. Between the conducted workshops was a gap of three days. In the first workshop, designers introduced relevant data from their own lives, while in the second workshop only data from the research information relevant to the designers’ work were applied. At the end of the first workshop each designer presented their ideas to the others; for example, they had to report what initiated the idea and what the benefits were. These ideas were then discussed among the designers in terms of how the idea worked, for whom and why. Three days later, when the second workshop was conducted, the research information was presented to the designers with cards and theme posters. Next, the designers had to look more closely and ask the researchers about the research. After this, designers were given time to come up with new ideas or change their designs. Researchers took turns in order to be able to provide each designer with enough information. Finally, the designers presented their models or drawings to the group, who then discussed the usefulness of the designs.

Van der Lugt and Sleeswijk Visser (2007) presented an intense creative workshop where they tried to work out the correlation between the level of empathy with the user in the product development process and creative problem solving. A team of designers, researchers and sellers was lead through a five-stage process of *sensitizing, immersing, structuring, generating understanding and developing concepts* (ibid). In the *sensitizing* stage, participants had the opportunity to develop an understanding about the users who would be involved, and gained some experience of the workshop. This stage started one week before the workshop and it was important to achieve a

²⁶ Transformational creativity is “*making transformations that enable the generation of previously impossible ideas*” (Boden, 1998: 348).

²⁷ Combinational creativity “*involves novel (improbable) combinations of familiar ideas*” (Boden, 1998: 348).

higher level of engagement at the workshop. The *immersing* stage, which lasted one hour or more, enabled participants to become familiar with the user data; however, the designers were required to only think about the data, “*stepping away from the solution-focussed ‘pressure cooker’ style of creative sessions*” (Van der Lugt and Sleeswijk Visser, 2007). The *structuring* stage then followed, with the purpose of “*identifying interesting connections or mini-theories, which are then developed and strengthened (or rejected) by adding data elements*” (Strauss and Corbin 1990, cited in Van der Lugt and Sleeswijk Visser, 2007). In this stage participants had to identify a small number of themes and elements relevant to the design challenge. For this task a poster was used. However, because of the huge amount of data, researchers then created *cards* with pre-selected data from individual users. The *Identifying insights* stage aims to establish directions for new ideas based on users’ needs and desires. This problem-solving stage focused on the user, however, not necessarily keeping strong links between user data and ideas. In the last *developing concepts* stage, ideas are transformed into product concepts by sketches and establish product characteristics as well as identifying pros and cons (Van der Lugt and Sleeswijk Visser, 2007).

To conclude, these researchers decided to use different approaches to achieve their aims. Maiden and Jones (2007) focused on the design process, Sitorus and Kilbourn (2007) adopted video material, concept cards and raw materials to make paper prototypes. Furthermore, Jones et al. (2008) concentrated on supporting *exploratory*, *transformational* and *combinational* creativity and focused on a five-stage process (Van der Lugt and Sleeswijk Visser, 2007). In the next section, the author’s four-stage creative process will be presented, where various new and existing creative methods were adapted, and different tasks were completed.

6.2.2.2 DESIGN OF CREATIVE WORKSHOP FOR STUDY 3

In this section all elements used in the workshop are listed and then described in more detail. The workshop had two parts, following Wallas’ description of Poincare’s creative process (Wallas, 1926). The following (creative) methods and tasks were adopted:

1. First part

a.) Preparation stage

- Cultural Probes (creative method²⁸)
- Presentation (linking element of the creative workshop)
- Icebreaker (task)

²⁸ The applied creative methods aimed to stimulate the participants’ creativity during the creative process, whereas tasks had certain purposes: for example, the facilitator was talking to participants about mental blocks that participants have to avoid.

- b.) Incubation stage
 - Removing mental blocks (task)
 - Scenario (task)
 - Brainstorming with the Creative Cards (creative method)
 - Voting for the 'Golden Idea' (task)

2. Second part

- c.) Illumination stage
 - Tell me, Draw it and Make it worksheets (creative methods)
 - Presentation of the final design (task)
- d.) Verification stage
 - Questionnaire (task)

Each task and creative method will be described in more detail in the next part.

In the first part, which started with the **preparation** stage, the following methods and tasks were applied:

a.) Cultural Probes

The purpose of the Cultural Probes here was to remind participants of the creative work and data that they had gathered in the first part of the study that could be used in the creative workshop.

b.) Presentation

A key point of the workshop was a presentation, which was designed based on Maiden and Jones (2007) and had the following aims:

- To lead participants through the creative process; the presentation followed the timetable of the creative workshop
- To deliver visual information, for example, display examples of paper prototypes, sketches, storyboards
- To deliver written information in a clear manner, for example, the timetable, the questions for the Ice Breaker, the scenario during the entire creative workshop
- To follow the Wallas and Poincaré creative process.

c.) Ice Breaker

This method was applied to get participants familiar with each other. Each participant had to ask their partner their name and activities in their free time, their favourite device, and their most pleasurable experience with their favourite device (see figure 51).

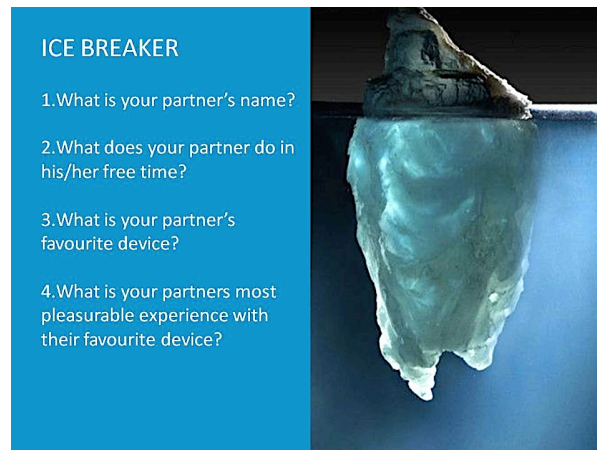


Figure 51: In the icebreaker session four different questions related to the use of technology were used. Participants got instructions in written form (photocopies) and displayed on slide.

Then the following tasks were conducted in the **incubation** stage:

a.) Removing mental blocks

Participants were shown a slide which presented the Roger von Oech mental blocks (see section 2.2.4.3) that participants had to avoid during the brainstorming session (see Figure 52).

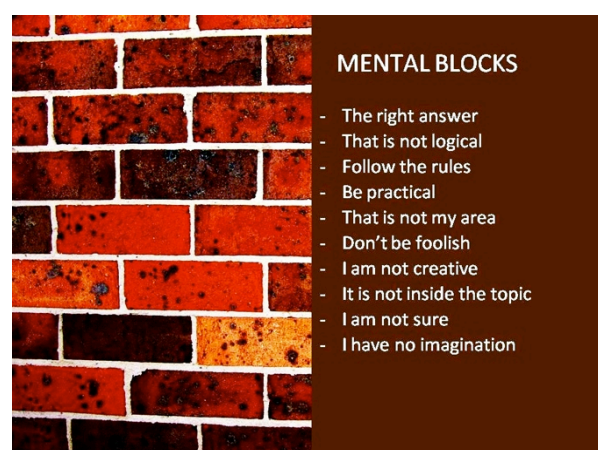


Figure 52: A list of Rogers von Oech's (1983) mental blocks was used to advise participants on how not to block creativity.

b.) Scenario

This method was used to help participants put themselves into the designers' place. Participants had to think of themselves as designers at Global Digital, who need to design a digital device for older people (see Figure 53).

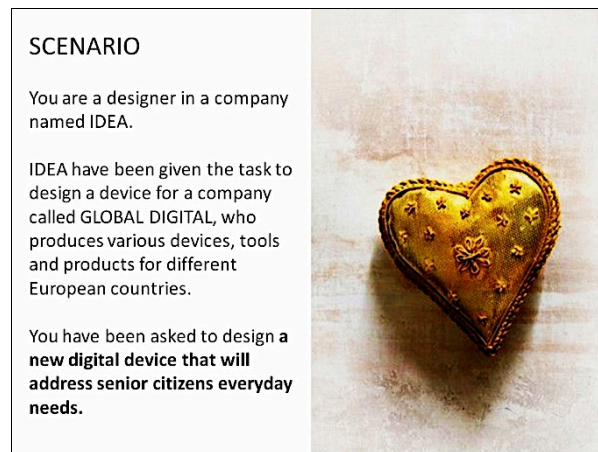


Figure 53: A simple scenario was used to put the participants in the role of a designer.

c.) Brainstorming with the Creative Cards

Forty-five Creative Cards were used for annotating the creative ideas in the incubation stage; the main aim of this method was to stimulate creative ideas during the brainstorming stage. Each card had two parts: on the right side of the card was placed a word, which was illustrated with a visual representation (a photo) (see figure 54). Some key words and photos on the Creative Card were previously used in the mind map which was one of the tasks in the Cultural Probes study. Therefore, participants were already familiar with this material. Photos and key words partly answered four questions that were used at the brainstorming: what will this device do and when, where and how will the device be used? Approximately nine cards were designed to answer each question; some blank cards were added to complete the set (see Figure 55). Participants used cards to write on them or to deliver their idea with a group of cards. The cards were entirely developed by the author; however, Robertson and Robertson (2004, cited in Trusso et al., 2005) used a similar approach.

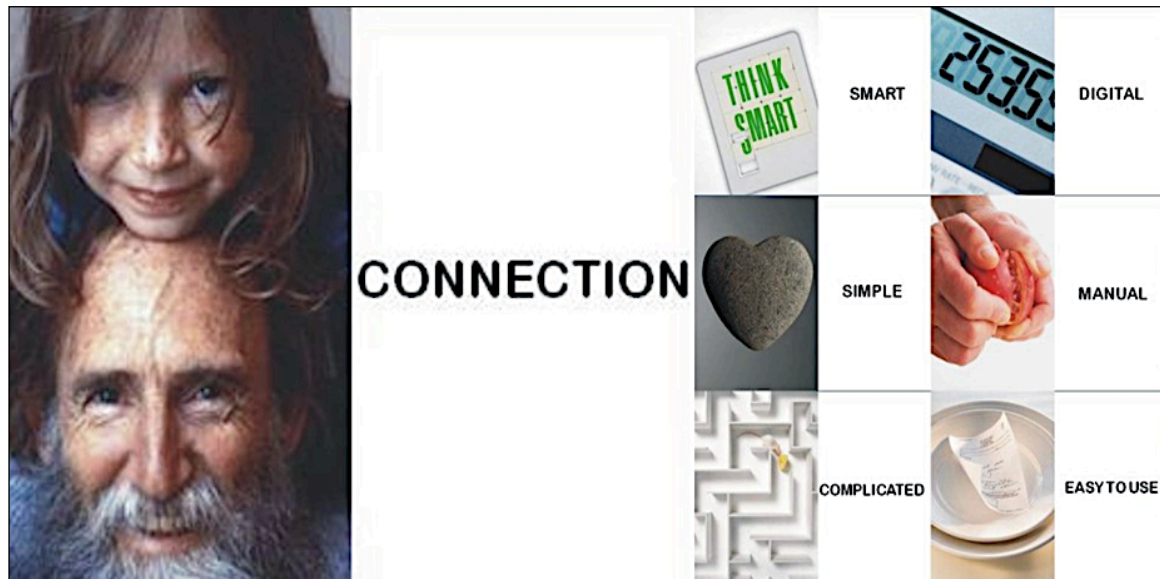
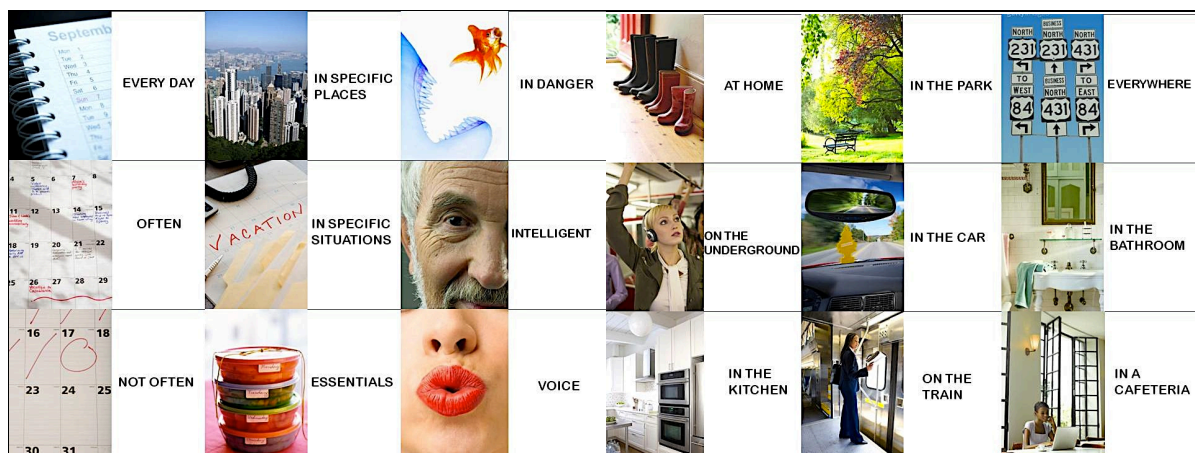
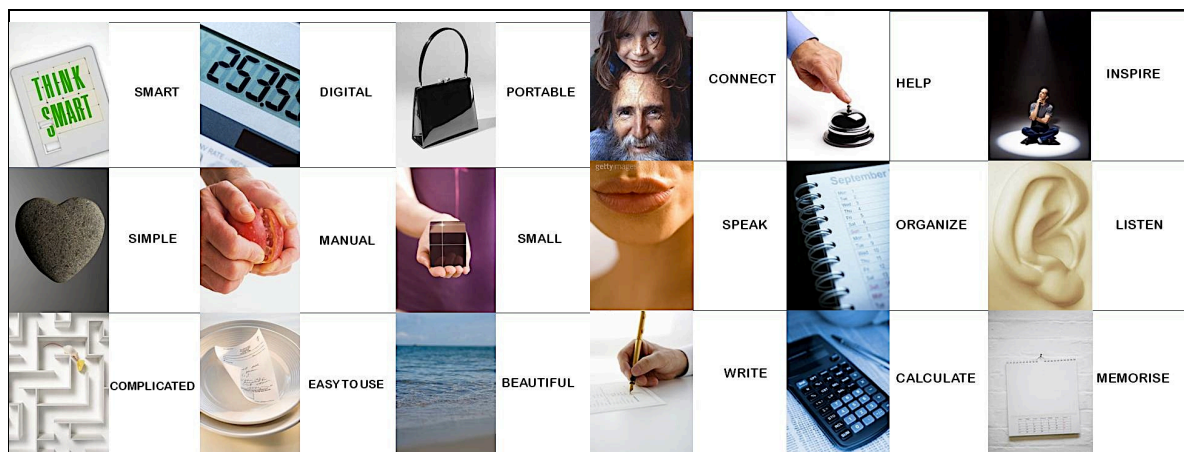


Figure 54: An example of a creative card (left and right), which provided a key concept (e.g. 'connection') and an appropriate visual stimulus (e.g. a picture of grandfather with a grandchild).



	FRIENDLY		WIRELESS		BUTTONS		A GESTURE	EMPTY CARD	EMPTY CARD
	COMPLEX		PLAYFULL		INTERFACE		MOVEMENT	EMPTY CARD	EMPTY CARD
	CREATIVE		A UTENSIL		TANGIBLE	EMPTY CARD		EMPTY CARD	EMPTY CARD

Figure 55: Forty-five creative cards. Key words and images were taken from the Cultural Probes (the mind map task), with which participants were already familiar, to design Creative Cards.

d.) Voting for the Golden Idea

Voting for the best idea had three main purposes: i.) to reduce the number of ideas by identifying the least popular ideas; ii.) to identify ideas that were the most appropriate way to address the scenario; and iii.) to give all participants (older people and designers equally) the opportunity to express their opinions. Each participant received five stickers (five voices) in the shape of a golden star with which each participant then marked their preferred ideas. Participants could give all their voices to one idea or five different ideas. The Golden Idea was the idea that responded to the scenario in the most appropriate way.

In the second part, which started with the **Illumination** stage, the following methods were applied:




a.) 'Tell me', 'Draw it' and 'Make it' worksheets

Worksheets were designed, based on Jung and Chipchase's (2008) creative sheets, which were used by Nokia Open Studio to collect new ideas for future mobile phones in poor communities (see figure 56). The Nokia Open Studio worksheet had five sections:

- the participant's personal details
- the title of the idea
- a space for sketching and describing the idea (what it looks like, what it does, how you will use it, when and where you will use it)
- details about the participant's idea, such as a summary of the idea, the three best things about the idea, a description of the situation where this mobile phone would be used, and who would most like this kind of mobile phone

- **'Tell me'**, where participants were able to present their ideas verbally by recording their voice with a dictaphone (see Figure 57, top middle)
- **'Draw it'**, where participants got the opportunity to present their ideas visually with sketches and by drawing a storyboard (see Figure 57, top left, 58)
- **'Make it'**, which assisted participants with building the paper prototype (see Figure 57, top middle). Part of this was also 'Magic box', which contained various materials to make paper prototype.

The worksheets had different front pages, although two inside pages were the same in all three sets (see Figure 57, bottom right and left). Participants were required to answer the following questions: i.) *What is the name of your device?* ii.) *What does it do?* iii.) *How, when and where will it be used?* iv.) *What are the three best features of the device?* v.) *How does the device fit into your life?* and vi.) *Describe one unique situation where the device could be used and how* (see Figure 57, bottom left).

 <p>3. Tell me about your idea and ask for assistant.</p>	<p>1. Draw and describe your new digital device.</p> 	<p>2. "Magic box"</p>  <p>Instruction In the box you will find different materials, scissors, tape, cardboard. Try to build together with your partner a prototype.</p>
---	---	---

<p>Describe your idea</p> <p>1. The name of this new device is... _____</p> <p>2. What does it do?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>3. How will you use it?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>4. When and where will you use it?</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>5. What are the best 3 things about your new idea.</p> <p>★★★★</p> <p>★★★</p> <p>★</p> <p>6. How does this new device fit in your life?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>7. Describe one unique situation that this new device will be used and how?</p> <p>Draw</p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 40px; height: 40px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px;"></div> <div style="border: 1px solid black; width: 40px; height: 40px;"></div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>● Situation</p> <p>_____</p> <p>_____</p> </div> <div style="width: 45%;"> <p>● How</p> <p>_____</p> <p>_____</p> </div> </div>
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Figure 57: In the top row are presented covers of three different approaches of author's worksheets 'Tell me', 'Draw it' and 'Make it'. In the bottom row are displayed second and third worksheet, which were the same for all approaches.

- string
- bubble wrapping paper
- stickers
- styrofoam

Each box had slightly different contents, depending on available materials.

c.) Presentation of the final design

At the presentation, participants were required to present their idea to the other groups and explain it by answering a list of questions (see figure 60).



Figure 60: The final presentation: at the end of the workshop the participants needed to present their idea to the other groups.

In the last **verification** stage, participants were required to answer a questionnaire, which was used to collect quantitative data. The applied questionnaire was based on Jones et al.'s (2008) paper, where the creativity of the final output was measured based on novelty and appropriateness (Sternberg and Lubart, 1999). In the first part of questionnaire, participants were requested to evaluate the applied methods at all stages of the creative process, as well as the facilitation. In the second part they were asked to estimate the novelty and the appropriateness of their own idea, followed by the ideas of the other groups (see Appendix 9).

6.3 ANALYSING THE CREATIVE PROCESS AND OUTPUTS

The purpose of the main study was to answer the second research question, *“Can older people be involved as equal partners in a creative UCD process for developing digital devices?”* This necessitated investigating whether key indicators of creativity were affected by different numbers of older people in the creative workshop settings. Chosen indicators were flexibility, flow, and factors that stimulate and block creativity. In the following sections these issues will be discussed: i.) measuring creativity during the design process; ii.) analysing video data approaches from other researchers; and iii.) lessons learned from the pilot study.

6.3.1 MEASURING CREATIVITY DURING CREATIVE PROCESS

6.3.1.1 OTHER APPROACHES TO CHOICE OF PARAMETERS

This section will review how different researchers measured creativity during the design process, which parameters were selected for this, and how they defined an idea.

Fern (1982) conducted studies where creativity was measured with individuals, groups of people with four and eight members, and focus groups with eight people. The result of the study was 600 pages of transcripts of conversation. Ideas that were counted in the text were defined as *“utterances expressing a thought in a meaningful, relevant and unique way”* (Fern, 1982:6). This thought needed to be meaningful to the editor, relevant to the discussion group and unique, rather than a restatement or a previously-stated idea. Results showed that individuals created more ideas than focus groups, and eight-member groups developed more ideas than those with four members. However, no difference between focus groups and unmoderated discussion groups was indicated.

Sosik et al. (1999) were interested in the effect of leadership style and unknown flow on groups of undergraduate students performing a creative task using the Group Decision Support System. Flow was described using three aspects: i.) Csikszentmihalyi's (1990), Deci and Ryan's (1985), and Ghani and Depshande's (1994) notions of flow associated with enjoyment and control; ii.) Csikszentmihalyi's (1990) concentration on the task at hand and iii.) Csikszentmihalyi's (1990) key elements of flow related to goals and feedback provided on the task. In addition, Sosik et al. (1999) observed correspondence between challenge and skills, and a changed sense of time. Creativity was defined by Torrance's (1965) four dimensions of creativity, which were fluency, flexibility, originality and elaboration.

Kristensson et al. (2004) investigated the value of users' ideas compared to ideas generated by a mobile telecommunication company. The advanced users, ordinary users, and professional product developers were given the task of creating ideas for future mobile phone services. An experimental three-group design was used in order to assess the creative output. Kristensson et al. (2004) focused on creative performance, which means the ability to generate creative ideas. Creativity was evaluated using four parameters: i.) originality, the element of the newness of an idea; ii.) value, the extent to which an idea solves a perceived problem; iii.) realization, the possibility of developing an idea into a commercial product; and iv.) the number of ideas.

To conclude, different scholars decided on different approaches to measuring creativity, whether this was flow, Torrance's (1965) four dimensions of creativity or originality, value realisation, or the number of ideas. However, the author decided to select her own parameters. The next section examines various approaches to analysing video data.

6.3.1.2 OTHER APPROACHES TO ANALYSING VIDEO DATA

In this section other researchers' approaches to analysing video data during the design process will be examined.

Qualitative data analysis and content analysis are approaches that are frequently reported in the area of health and social science (Thomas, 2003). These analyses are aimed to identify categories from raw data, which could be textual or video material. The first method, with an inductive approach, identifies frequently-occurring patterns in the raw text data, together with frequent, dominant or significant themes, and summarises them into a brief format (Thomas, 2003). The second method, adopted by Marvasti (2004, cited in Silverman, 2006), investigates textual data, especially in the field of mass communication, where researchers establish a number of categories and then count instances suitable for a particular category (Silverman, 2006). It is important that categories are established precisely in order to ensure the reliability of the final results. Identified categories or features in visual material could be artefacts, videos or photos. However, Marvasti (2004, cited in Silverman, 2006) reports that content analysis of visual data could only analyse "*what is visible on the surface – the image itself*" but not what is behind it.

Adams (2001) and Valkenburg (2000) investigated the production of design teams and analysed it based on Schön's (1983) theory '*Reflection-in-Action*' (for more information see section 2.2.3.2).. Valkenburg (2000) reported that this analysis of video data has the following limitations: i.) the observations capture only actual behaviour but not the motives behind it (for example, conflict); ii.)

the observations are limited to the defined period of time for the duration of the experiment (a couple of hours, but not months); iii.) the richness of captured video data that demands a large amount of time for analysis, and iv.) the way the data is analysed and perceived requires a clear vision of the task, and a good plan for the task.

Dorst (1997, cited in Valkenburg, 2000: 63) tested Schön's approach to decrypting video data from nine designers working individually on a design task, when they were required to '*think aloud*'. Dorst (ibid) reports the following disadvantages to this approach: i.) problems with identifying frames and moves (very quick actions that might be missed in the designers' talk), ii.) a little interpretation was needed, since the designers' words were taken as accurately describing the designer's actions, and iii.) describing design as a reflective practice blurs the relationships between the design process, the design task and the designer. Therefore, Dorst (1997, cited in Valkenburg, 2000: 63) expresses a need for defining a more appropriate reflective practice.

None of the approaches described was appropriate for being applied completely, although knowledge from these studies was brought forward.

6.3.1.3 DESIGN OF ANALYSIS FOR STUDY 3

1. Lessons learned from pilot study

In this section firstly difficulties with measuring chosen parameters will be presented, and then important lessons learned from analysing the video data will be discussed. The following problems in measuring creativity during the design process were identified:

- Measuring creativity according to Guilford's (1959) four factors by counting verbs in sentences requires the transcription of all audio data, which was very time consuming because of the very large amount of data. Therefore, a method was required which would allow a lighter and quicker approach to obtain the results without limiting quality.
- Factors that stimulate and inhibit creativity based on Study 2 were identified. However, more research needed to be done on a literature review to support the identification of factors which stimulate and block creative ideas.
- Measuring final creative output with questionnaires might not be the most appropriate way, since the participants scored their ideas very highly. In addition, older people had problems with understanding the terminology in the questionnaire. Therefore, it might be necessary to ask for the opinion of an independent expert.

The following lessons were learned from analysing video data: i.) transcribing conversations was time-consuming and in some sections the recording was unclear; ii.) because three individuals were involved in the conversation it was difficult to identify who said what; iii.) it was impossible to identify what exactly was happening during the design process (for example, how the participants were building the prototype) only by analysing transcriptions; iv.) sketches, worksheets and photos of the prototype were not included in the current method of analysing video data, v.) because in the illumination stage the highest number of topics and no blocks were identified, the decision was taken to concentrate on analysing data from the illumination stage only.

As the transcribing method was too time-consuming, a method that was easy to use with a light approach was required.

2. Measuring flexibility with topics

In this part flexibility will be discussed as the main factor which was measured in the topics and how the main unit has been identified by other researchers. Then, how the author defined the main topic unit will be explained, with when the topic starts, finishes and what is not part of the topic.

Guilford (1959: 170-174) was the first to identify flexibility as one of the components of divergent thinking (see section 2.2.2.1). Guilford (1959: 172) defined *flexibility* as producing a wide variety of ideas and stated, “*creative thinkers are flexible thinkers*”. Guilford (ibid) distinguishes between two types of flexible thinking: a.) *spontaneous flexibility* that is the ability to produce “*a great variety of ideas*” and *adaptive flexibility* which facilitates the solution of a problem. The next to describe *flexibility* was Torrance (1966, cited in Warr and O'Neill, 2005a:636) according to whom flexibility is “*the number of categories of ideas that were generated*”. Then, Warr and O'Neill (2006:123) established a new definition of flexibility based on Torrance 's (1966) definition of scoring metrics, which was that *flexibility* is “*the number of different approaches or categories of ideas produced*” (for more information see section 2.2.4.1).

Runco (1999) identifies fluency and originality as the scores which are the most frequently considered for measuring divergent thinking. However, the next most common score is flexibility for two main reasons: “*high flexibility precludes rigidity in problem solving, and it guards against an artificially inflated originality score*” (Runco, 1999: 578). Runco (1999) states that an examiner who measures flexibility could place many unique ideas in the same category, although they would not be very original ideas in comparison to others. However, if the examiner measures flexibility,

although the originality score will be high, the low flexibility score will indicate that the originality score is exaggerated.

In the next part, the way in which the definition for the main unit was established will be discussed. Firstly examples from other researchers will be presented, and then the author's definition of the topic.

Stumpf (2001) analysed a design session using verbal interaction between participants and their non-verbal behaviour. This researcher used video material to record participants' gestures, deixical references and interaction patterns. To analyse the transcript Stumpf (2001) adopted discourse analysis, as a qualitative method to investigate conversations. Grosz (1977, cited in Stumpf, 2001: 76) and Reichman (1978, cited in Stumpf, 2001: 76) suggests using for this analysis larger linguistic units above sentence level, in naturally occurring speech or writing. Units could be further divided into two emphases; one of these could be a unit or smaller item, for example a topic. Grosz (1977, cited in Stumpf, 2001: 76) and Reichman (1978, cited in Stumpf, 2001: 76) states that topics are units *"used to interpret smaller items contained within them and form a context for the interpretation of items such as deixial references"*.

Tang and Gero (2001) proposed a cognitive method to measure creativity in designing. Researchers divided verbal protocol into a small unit called a *segment*, which *"consists of pieces of information that appear to have occurred simultaneously in the designer's mind. New segments could be flagged by thought shifts or change of physical actions ..."*. The length of these segments could range from a couple of words to several sentences.

While ideas were counted by verbs in sentences in the pilot study, in the main study, because of the huge amounts of data, categories of ideas were identified using a number of different topics. The number of different topics were related to *flexibility* using Guilford's (1959) definition of *a wide variety of ideas*. It was difficult to identify the main unit, which would be applicable over video and audio data; however, in the end the topic was defined as follows:

Topic is discussion (exchanging ideas) among members of the group about a certain theme.

Topics could be from one to more than ten minutes long. Below are some examples of topics:

- Discussion about the speakers that the new device would have
- Discussion about the device's dimensions, its form and portability
- How the device would interact with the user

- Designer was demonstrating how the calendar would be used
- Participants discussing cognitive impairment
- Care for people with memory problems and how to address this issue with a digital calendar
- Mobile phone technology and how this could be linked to the paper prototype

A new topic starts when a person in a group asks a question or starts a conversation, which indicates a different theme from the previous one. The topic finishes when the discussion is interrupted for some reason, for example:

- when someone left the group (for example, when a participant went to the toilet or got refreshments)
- when someone started a conversation on a new topic or asked a question, which was not related to the previous topic or had not been discussed before
- when the facilitator interrupted the group by delivering additional explanations or there was a longer period of silence

Below is an example, which illustrates the start and finish of a topic in a group of older people and designers.

The OP³⁰ changed the topic of conversation from D's demonstration of how an iPhone is used. OP started to talk about the audio speakers that the device would need.

....

D changed the previous discussion about audio speakers by asking what the dimensions of the device would be. Then, he drew the device, showing where speakers could be placed, how thick the device would be, where the buttons would be placed, and so on.

This led to starting a new topic and a breaking of flow. However, a topic was not counted when an older participant started to discuss issues that were not related to the creative workshop (for example, teaching experiences in a primary school, telling a joke, discussing a BBC TV serial about young apprentices, etc.). These conversations were counted as topics not relevant to the creative workshop and factors that inhibited creativity (see Table 19).

3. Measuring flow with turns

Csikszentmihalyi (1990) stated that one of the key elements of flow is *"goals and unambiguous feedback provided by the task"*. Kerne et al. (2004) state (see section 2.2.4.4) that one of the by-

³⁰ Explanation of the symbols: Older person - OP, Designer - D (see Table 23).

products of creativity is flow. Building on Kerne et al. 's (ibid) definition of flow in individuals I decided to count turns as an indicator of creative flow in a group or a measure of feedback that sustains engagement. The term "turns" was defined by Kulesza et al. (2009: 191) who say:

"A turn consisted of sentences spoken by a participant until his or her partner next spoke. Speech by one participant that contained a significant pause was segmented into two turns".

4. Measuring factors that stimulate and inhibit creativity

Several authors have identified general factors that support or increase creative activity. For example, Sosik (1998) suggests that encouragement, stimulation, and reward all tend to stimulate creativity, and Loi (2007) discusses the use of Playful Triggers to increase engagement and richness of discussion between group members as a result of better teamwork.

In order to measure the degree of success in delivering creativity during the creative process, factors that stimulate creativity were measured. Paulus (1999 and 2000) studied this subject in more detail; various factors are described that stimulate creativity (see section 2.2.4.2); Although Paulus's (1999) description of stimuli is very general, three of Paulus's factors that stimulated creativity, and that were the most relevant to the gathered data, were selected.

a.) Factors that stimulate creativity

Paulus (1999:781) identified a number of factors that stimulate creativity during group work, including group information exchange leading to the development of more complex ideas; conflict leading to re-evaluation and development of ideas; and the possibility of viewing different options for solving problems. Numerous authors have proposed the use of particular techniques such as brainstorming, mind-mapping, analogical reasoning and constraint-removal for stimulating creative thinking, and there have been some studies (e.g. Jones et. al. 2008) that seek to compare the effectiveness of such techniques in generating new ideas. There has so far been little research on what stimulates creativity in older people. However, work done in a previous study (Sustar, 2011) suggests that a source of ideas of particular relevance for older people is their own life experiences.

Below is each selected stimulus illustrated with the description of what was happening during the topic (see Appendix 15):

- viewing different options

Example

The mixed yellow group

OP1 asked: *"How will you communicate with the device? By speaking?"* D2 suggested alternative ways. Then they looked for the best solutions for interacting with the device. D1 suggested that those with severe dementia would have a more strict procedure. D2 was talking about a GP and forgetting to turn the tap off. D1 was listing features that the device would need to have: shopping list, connection to a GP; people with memory problems always have a list of notes.

- developing more complex ideas because of group information exchange

Example

The mixed yellow group³¹

OP1 asked *"How will the device be used?"* D1 said that user would use the wall that could look at it. D2 said so you could add information there. OP1 asked: *"Will the person talk to and write on the calendar?"* D1 said that people would rather write down more complex things. D2 suggested making a list of technology that already exists. OP1 asked: *"How will you check that person was reacting to the device?"*

- conflict which re-evaluates ideas (positive disagreement)

Example

The mixed red group

OP1 was drawing on a post-it note. D1 was suggesting different possible options that were available on the market (e.g. interactive table) and presenting different possibilities of TV use. OP1 was drawing and paying attention to other members. OP2 said that the device did not need to be that basic. Both older people suggested a touch screen and D1 drew a touch screen on the worksheets.

In addition, based on the nature of the data and Study 2, several additional factors that stimulated creativity were identified. Three stimuli were identified based on methods that were applied: stimulus from worksheets, from *'Draw it'* and stimulus from materials. A further two stimuli were identified from technology and life experiences. All factors which stimulated creativity in the illumination stage are presented in the table (see Table 17) (see section 2.2.4.2).

³¹ Explanation of the symbols: Older person 1 - OP1, Designer - D1, Designer - D2 (see Table 24).









Graphical symbol	Name	Definitions from literature	An example
Factors that stimulate ideas			
 VDO	Viewing different options	Viewing different options individual can improve their approach to the task. (Paulus 1999:781)	OP1 asked: "How will you communicate with the device? By speaking?" D2 suggested alternative ways. Then they looked for best solutions to interaction. D1 suggested that those with severe dementia should have a more strict procedure. D2 was talking about GPs and forgetting to turn the tab off. D1 listed features that device would need to have: shopping list, connection to the user's GP. People with memory problems have a list of notes; they were making notes all the time.
 CI	Complex ideas	Group make it possible for individuals with one interest to develop more complex ideas (combination of ideas from different ideas) because of group information exchange. (Paulus 1999:781)	OP asked "how will you use the device?" D1 said that user will use the wall. D2 said so you could add information there. OP asked: "Will the person talk to or write on the calendar?" D1 said that people write rather more complex things than learn sophisticated things. OP asked: "How will you check that the person was reacting to the device?"
 CO	Conflict among members	Conflict among members individuals can re-evaluate their suggestion and result can improve the idea (Paulus 1999:781)	D suggested different possible options that were available on the market (interactive table) and presented different possibilities of TV use. OP 2 said that the device did not need to be that basic. Both OP suggested a touch screen and D drew a touch screen on worksheets.
Methods stimuli			
 WS	Stimulus from questions on worksheets		Idea is stimulated from questions on work sheets e.g. <i>What will the device do?</i>
 DI	Stimulus from materials – 'Magic box'		When a participant's idea is stimulated by materials in the 'Magic box'
 M	Stimulus from 'Draw it'		Idea is stimulated from the 'Draw it' part of work sheets (participants use using drawings to express their ideas)
Other stimuli			
 T	Stimulus from technology		Idea is stimulated by any kind of past, present or future technology (e.g. iPhone)
 LE	Stimulus from life experiences		Idea is stimulated by participant's life experiences (e.g. experiences with people with dementia).

Table 17: All identified factors that stimulated participants' creativity in Study 3.

b.) Factors that inhibit creativity

Davis (1999: 165) defines barriers that inhibit creativity as "*blocks, internal or external, that either inhibit creative thinking and inspiration or else prevent innovative ideas from being accepted and implemented*". He distinguished between five categories of blocks that inhibit creativity: learning and habit, rules and traditions, perceptual barriers, cultural, emotional and resource barriers. Von Oech (1983) has also identified blocks to creativity such as looking for the 'right' answer, feeling a need to be serious rather than playful, and individuals feeling they are not creative.

Paulus (1999: 780) identified a number of factors that can inhibit creativity in the context of group work including: premature judgement of ideas; negative conflict; too much or too little similarity in background between group members (leading to lack of interest or lack of understanding); and lack of attention by individuals to their own ideas in comparison to those produced by the group. Some of the other blocks identified by Paulus in relation to social phenomena in a group were later researched by Warr and O'Neill (2006) who investigated 'production blocking', whereby one group member blocks others from expressing their ideas, for example by constantly speaking, or holding the only pen; 'evaluation apprehension', where members of a group are prevented from voicing their ideas by fear of criticism from others; and 'free riding' or 'social loafing' where some group members may become lazy, relying on others and not contributing as many ideas as they could. Once again, there has so far been little research on what might block creativity in older people in particular. However, work done in a previous study (Sustar, 2011) suggests that both cognitive limitations, such as increased confusion, and physical limitations such as frequent needs to take refreshment or go to the toilet may impact on older people's creative activities.

Different authors (Davis, 1999; Paulus, 1999 and Warr and O'Neill, 2006) have investigated the factors that can inhibit creativity. Based on the nature of captured video it was decided not to apply Warr and O'Neill's inhibiting factors, but instead use Paulus's. However, Paulus's factors are not delivered very precisely or illustrated with examples; they are more like guidelines or recommendations than factors that we can count; therefore Davis' (1999: 165) definition of barriers that inhibit creativity (see section 2.2.4.3) was applied for this study. Below is one of Paulus's (1999) factors that was identified while analysing data, illustrated with an example:

- Conflict or disagreement among members that inhibited creativity³²

Example

OP1 and OP3 were arguing who would draw the storyboard.

In the study conducted (study 3) two of Paulus's factors (Paulus, 1999: 781) were identified: conflict among participants and off-topic discussions not related to the creative workshop (see Table 18). In addition three new factors that inhibited creativity were identified in study 3: physical needs (such as toilet, hunger), confusion and talking off topic.

³² This conflict situation happened in a study in a heterogeneous group of older people, when some older people did not want to listen or consider the opinions of other older members and they acted more as a set of individuals than as a group.








Graphical symbol	Name	Definitions from literature	An example
Factors that block ideas			
Facilitator and assistant interrupted creative process			
	Facilitator		When participants' creative engagement is blocked because of a disruptive facilitator.
	Assistant		When participants' creative engagement is blocked because of a disruptive assistant.
Other blocks			
	Conflict	The group member presenting the conflict perspective tends to produce negative reactions from other group members (Paulus (1999))	When participants' creative engagement is blocked because of disagreement with another member of the group.
	Confusion		When participants get confused (e.g. do not understand instructions).
	Off topics		When participants talk about topics not related to creative workshop (e.g. a TV serial, their flat).
Physical needs			
	Toilet		Participant needs to go to the toilet during the creative workshop.
	Refreshments		Participant breaks for refreshments during the creative workshop.

Table 18: All identified factors that inhibit participant's creativity in the Study 3.

5. Procedure: analysing video data

Based on experiences from the pilot study it was decided to analyse data from the illumination stage of each workshop. The stage started when the facilitator gave the 'Magic box' and worksheets to participants. This phase lasted approximately 45 minutes. Firstly, all videos were watched and audio material was listened to in order to identify when and where topics started or finished. The start and finish of each topic was identified (see Table 19, column 2). The times calculated were inserted in the designed table (see Table 19). Topics were the base for counting turns in the next stage. In addition, identified topics were described with number, title, how the topic started and how it ended (see Table 19, column 1). While viewing videos notes were made, which described what happened during the topic (see Table 19, column 6). At the same time factors that inhibited and stimulated creativity were identified (see Table 19, columns 4 and 5) and photos of sketches, drawings and final paper prototypes were included where necessary. In addition, blocks caused by the facilitator were identified, as well as periods of silence or when nothing happened.

In the second part of the analysis video material was listened to and the turns inside each topic were counted. These turns were then added to a graphical representation of turns (see Table 19, column 3). A colour scheme (see Table 19, column 6) was designed at the same time, in which different

coloured arrows represent the number of turns. Finally, all turns within one topic were counted and acknowledged in a separate table.

For the results see section 7.3.

Name of the group				Colour scheme for turns		Blocks and stimuli	
Illumination Stage 45-60 min Mix - Yellow group				Creative blocks		Content of the topic (video data)	
1. The number of the topic	2. Topic title	3. Start of topic	4. End of topic	Creative stimuli		Number of turns	
Introduction				The length of the topic Time (audio data)		Creative blocks	
The group was designing an electronic and manual calendar.				start of the illumination stage 02:38:20		F Facilitator	
				1 min 10		Stimuli	
						S VDO Viewing different options	
						S CI Complex ideas	
						S CO Conflict among members	
						S LE Stimulus from life experiences	
						S WS Stimulus from work sheet	
TOPIC 9				F		D2 suggested to start with second question: "What the device will do?" D1 suggested situation, service. OP1 asked: "How you will communicate with the device? By speaking. D2 suggested alternative ways. Then they were looking for best solutions to interact. D1 suggested that those with severe dementia will have more strict procedure.	
Discussing what the device will do				S CO		D2 suggested to start with second question: "What the device will do?" D1 suggested situation, service. OP1 asked: "How you will communicate with the device? By speaking. D2 suggested alternative ways. Then they were looking for best solutions to interact. D1 suggested that those with severe dementia will have more strict procedure.	
Start of topic: 2:56:10				S VDO		D2 suggested to start with second question: "What the device will do?" D1 suggested situation, service. OP1 asked: "How you will communicate with the device? By speaking. D2 suggested alternative ways. Then they were looking for best solutions to interact. D1 suggested that those with severe dementia will have more strict procedure.	
D2 asked what the device will do?				S LE		D2 suggested to start with second question: "What the device will do?" D1 suggested situation, service. OP1 asked: "How you will communicate with the device? By speaking. D2 suggested alternative ways. Then they were looking for best solutions to interact. D1 suggested that those with severe dementia will have more strict procedure.	
End of topic: 3:02:15				S CI		D2 suggested to start with second question: "What the device will do?" D1 suggested situation, service. OP1 asked: "How you will communicate with the device? By speaking. D2 suggested alternative ways. Then they were looking for best solutions to interact. D1 suggested that those with severe dementia will have more strict procedure.	
D2 asked another question Where the device will be based?				S WS		D2 suggested to start with second question: "What the device will do?" D1 suggested situation, service. OP1 asked: "How you will communicate with the device? By speaking. D2 suggested alternative ways. Then they were looking for best solutions to interact. D1 suggested that those with severe dementia will have more strict procedure.	
Column 1				Column 2		Column 3	
Number, title, start and finish of the topic				Start and finish of the topic		Graphical presentation of turns in topic	
						Total number of turns in topic	
						Factors that stimulate creativity	
						Factors that inhibit creativity	
						Description of topic	
						Photo of the storyboard	

Table 19: Graphical representation of analysing data in the study 3 (for more information see Appendix 15).

6.3.2 ANALYSING CREATIVE OUTPUT

For assessing creative output researchers (Boden, 1998; Warr and O'Neill, 2004 and Maiden and Jones, 2008) use Stenberg and Lubart's (1999) definition of creativity, which says that creativity is *"the ability to produce work that is both novel (i.e. original, unexpected) and appropriate (i.e. useful, adaptive concerning task implications)"*. Therefore, it was decided to apply Stenberg and Lubart's definition of creativity to measure the novelty and appropriateness of the final output (see sections 2.2.6.1 and 2.2.6.2).

6.3.2.1 EXISTING METHODS FOR ANALYSING FINAL OUTPUT

Jones et al. (2008) suggest measuring creativity using questionnaires; however, there was some uncertainty if this approach would work with older people. In the end it was decided to apply Amabile's (1983, cited in Warr and O'Neill, 2005b: 120) approach who argues that creativity has to be analysed by the experts who determine the degree of creativity in a product.

6.3.2.2 DESIGN OF ANALYSIS FOR STUDY 3

In order to evaluate the novelty and the appropriateness of the final creative output, experts were invited to evaluate the creative output. Two independent design and usability experts specialising in the study of the older population evaluated the six paper prototypes produced at the end of the six workshops.

a.) Design

The entire study was designed on-line to avoid travel expenses and wasting time; as a result, the experts were able to access the study whenever it was appropriate for them. The professionals were required to observe six on-line videos where they were presented with paper prototypes and asked to answer a questionnaire about how novel and appropriate the presented prototypes were. The study required one and a half hours of the experts' time. The design of the study started in December 2009 with the editing of the recorded material; the videos extracted were from four to eleven minutes long. The videos were then uploaded on the Vimeo.com³³ web site, alongside an on-line survey which was placed on the SurveyMonkey.com³⁴ web site. Each paper prototype was presented using video with uploaded prototype photos (from one to four each). Photos were uploaded from Flickr.com³⁵. The usability of the entire study was tested before the questionnaire was sent to the experts. During the study experts were provided with additional explanations by e-mail. The study finished at the beginning of April 2010.

³³ Vimeo (2010) was created by filmmakers and video creators who wanted to share their creative work, along with intimate personal moments from their everyday lives.

³⁴ SurveyMonkey (1999) is the world's leading provider of web-based survey solutions.

³⁵ Flickr (Butterfield et al., 2004) is a web site where people can upload their photos and videos, as well as communicate.

b.) Participants

Altogether eight experts agreed to participate in the on-line survey. They were recruited based on personal recommendations and Internet investigation. Experts were from California (2), Cyprus (1) and Great Britain (5). However, only two participants finished the study; three experts completed one-third of the study and then gave up for unknown reasons. Both experts who evaluated the study were female, between 30 and 40 years old, and with 1 to 5 years of experience. The first expert described herself as working in the domain of research, focusing on inclusive design and product usability, and the second expert described herself as an accessibility and usability consultant.

c.) Apparatus and materials

The survey was placed on-line on the SurveyMonkey.com (1999) web site. Videos and photos were uploaded on to the Vimeo.com (2010) web site (see Figure 61).

d.) Procedure

At the beginning participants received an e-mail, which invited them to the study. The e-mail explained the researcher's background, what would be required from them and the time necessary to complete the study (see Appendix 14).

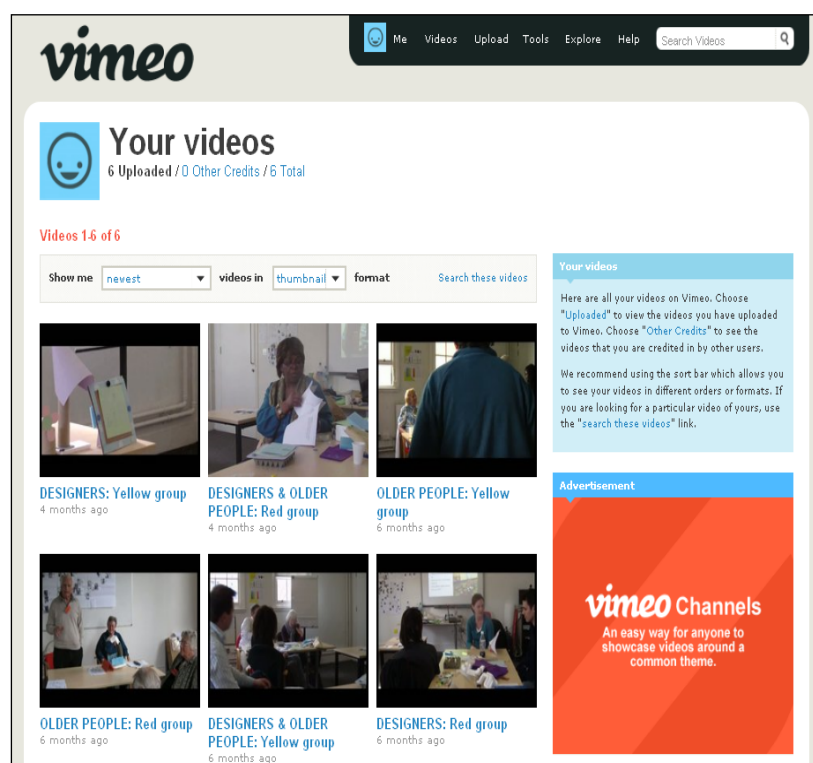


Figure 61: Videos were uploaded on the Vimeo website where the experts were able to watch them whenever they preferred.

If the experts replied to the e-mail positively, then they received the instructions as to how they had to proceed with the study. In the first part the experts needed to log on to Vimeo and the SurveyMonkey website at the same time. They were then required to answer the SurveyMonkey on-line questionnaire, which included their personal details, such as age, gender and research area, and their experiences in the domain of older people. In the second part they had to watch six videos on-line (from six to fourteen minutes in length) where groups of participants presented the 3D paper prototypes, and for each of the prototypes they were required to answer two questions: i.) *How new, surprising or exciting do you think this prototype is?* and ii.) *How appropriate do you think that the presented prototype is for the older population?* Their answers were expressed using a Likert scale (Sharp et al., 2007:314) from 1 to 5:

1	2	3	4	5
Not at all new				Very new
Not at all appropriate				Very appropriate

In addition, the experts were able to add comments on the prototypes they evaluated. For the results see section 7.3.

6.4 CONCLUSIONS

6.4.1 SUMMARISING CONTENT

This chapter consisted of two parts: methodology, and data analysis and final output. In the first part the methods adopted, such as the Cultural Probes, the creative workshop, Creative Cards, worksheets and the 'Magic Box' from other authors were reviewed followed by the authors own approach. In the second part, other researchers' methods of measuring creativity and analysing video data were firstly presented, and then lessons learned from the pilot study were reconsidered. After that, the definitions of the following parameters for measuring creativity were presented: flexibility, flow and factors that stimulate and inhibit creativity. At the end the approach for analysing creative output was presented. For the results see section 7.3.

7 STUDY 3: INVOLVING OLDER PEOPLE IN THE CREATIVE DESIGN OF DIGITAL DEVICES

7.1 INTRODUCTION

This chapter describes and analyses the setting up of three creative workshops: with designers, older people and designers, and older people alone. Video and audio data from the groups are then examined in order to record and measure the nature of the creative process, the groups' performance, the effectiveness of the methods used, and the novelty and appropriateness of the final creative output.

This chapter consists of five sections. The first section describes the conducted study, consisting of three creative workshops with their aims and objectives. The second section describes the methods applied, which were the same as the pilot study. It includes a short description of participants, the apparatus used, and the materials and space where the study was conducted follow. The third section is related to the analysis of data from the study and focuses on analysing data from the creative process, and the creative output. It also reviews the groups' performance in terms of group dynamic and method use. In the fourth section, there is a discussion of the effectiveness of the methods used. The chapter concludes with a summary.

7.1.1 AIMS AND OBJECTIVES

This study aims to answer the second research question:

CAN OLDER PEOPLE BE INVOLVED AS EQUAL PARTNERS IN A CREATIVE UCD PROCESS FOR DEVELOPING DIGITAL DEVICES?

Furthermore, Study 3 had two main objectives:

1.) To examine the nature of the creative process with different sets of people

This objective was examined by measuring several parameters in the illumination stage of the creative process. The issues were examined by measuring the number of turns per topic and factors that stimulated and inhibited creativity during the creative process.

2.) To measure the novelty and appropriateness of the final creative output designed by different sets of people

Novelty and appropriateness were measured based on Stenberg and Lubart's (1999) definition, and therefore several independent design experts were invited to evaluate the final paper prototypes.

The study also aimed to test the following hypothesis:

A CREATIVE USER-CENTRED DESIGN PROCESS CONDUCTED WITH MIXED GROUPS (OLDER PEOPLE AND DESIGNERS) IS BETTER FOR DESIGNING MORE APPROPRIATE PRODUCTS FOR OLDER PEOPLE THAN CONDUCTING THE SAME PROCESS WITH EITHER DESIGNERS OR OLDER PEOPLE ALONE.

7.2 METHOD

The applied method was based on a four-stage creative process which included activities that supported the preparation, incubation, illumination and verification stages. The process was described in detail in chapter 6.

7.2.1 DESIGN

Study 3 had two main parts: the preparation stage, where the Cultural Probes method was applied, and the creative workshop, with the four-stage Poincaré creative process (see Table 20). During the preparation stage the participants worked individually on the Cultural Probes, and they were asked to think about their relationships with a computer. During the second part, a one-day creative workshop, the participants were asked to design a digital device for the older population. During this part, three creative workshops were organized. The first one involved six designers with three participants in each of the two groups. The second workshop involved three older people and three designers who worked in two groups: the first (yellow) group consisted of one older person and two designers, and in the second (red) group were two older people and one designer (see Tables 22, 23 and 24). The third workshop involved six older people, with three participants in each of the two groups.

The structure of Study 3				
Stage of the study	Four-stage creative process	Participants	Creative methods	Design task
1. The first stage	1. Preparation	9 Designers 9 Active older people	The Cultural Probes - done individually	Users asked to explain relationships with the computer
2. The second stage	1. Preparation 2. Incubation 3. Illumination 4. Verification	Workshop 1: 6 Designers; Workshop 2: 3 Designers + 3 Active older people; Workshop 3: 6 Active older people	The creative workshops - group activity	Users asked to design a digital device

Table 20: The structure of Study 3.

The recruitment for Study 3 started with two presentations of the research to the MSc Human Centred System (HCS) students at the Inclusive module in February 2009 (see Table 21). After the presentation students had the opportunity to apply for the research; altogether ten students made a request. A week after the introduction presentation, seven Cultural Probes were delivered; all students completed the Probes, although two of them dropped out from the second part of the study because of time constraints. Four researchers from the Centre for Human Computer Interaction Design were also recruited, in addition to the students. Researchers were recruited by e-mail and through personal contacts. All four of them completed the Cultural Probes and they were invited to the second part. One week after first part of the study was concluded, interviews were held and during the beginning of March 2009 the first creative workshop with the designers was conducted. The date of the workshop was agreed with the participants and depended on the availability of a suitable place.

For the second creative workshop the older people were recruited after the presentation in the Hackney Silver Surfers HSS Centre. In the beginning there was not a lot of interest, since we were unable to provide any reward for participants; however, the interest immediately increased when we were able to obtain some vouchers. Besides presentations, participants were also recruited from the HSS Centre's website, leaflets and an advertisement at Islington Library. When the second group of students and the first group of older people completed the Cultural Probes and interviews, the second creative workshop was then organized at the beginning of April 2009.

The timeline for Study 3	
Time	Activity in the process of Study 3
February 2009	Recruiting designers by delivering PP presentation at the Inclusive Design module and Cultural Probes delivered to designers
March 2009	Designers' creative workshop was conducted and older people were recruited
April 2009	Mixed creative workshop was conducted and older people were recruited with the presentation in the Hackney Silver Surfers Centre
May 2009	Older people's creative workshop was conducted

Table 21: The timeline for Study 3.

The creative workshop with older people was organized last. The reason for this was that it was assumed that this workshop would require the largest amount of organization and experience; therefore, the experiences gained from the previous two workshops were important. The workshop was conducted in the middle of May 2009, before the summer holidays started.

The timing of the creative workshops, especially the two in which the HCS students participated, was very important. All studies needed to be completed before the Inclusive Design lectures finished and the exam period started.

Before each creative workshop, the participants were given instructions as to what to do if there was a fire. Also, car parking was organised for the older participants. In addition, all participants received precise instructions on how to travel to the place of the creative workshop, the content of the study and the facilitator's contact details.

From an ethical standpoint, each participant was aware how the data would be stored, and they were informed that each participant would be able to get a final report of the study. All participants were required to read the Explanatory Statement and sign the Informed Consent form, which were part of the Cultural Probes. However, none of the participants who wished to be part of the study declined. All the older participants were rewarded with a £20 M&S voucher; the students did not get any payment since the study was part of their educational process.

7.2.2 PARTICIPANTS

Altogether 28 participants were engaged in the entire study, with 18 completing both parts of Study 3. In the study the seven Human-Centre System (HCS) students and the four researchers from the Human Computer Interaction Design Centre were all from City University London, and 17 older people from the Hackney Silver Surfers Centre were involved. Thirteen older people received the Cultural Probes. For various reasons five persons (illness, death, long stay in hospital) did not

complete the study and four did not get back to me after they were contacted. In the end, nine participated in the study. In addition, two students resigned from the study because of time constraints, work or because their exams were approaching. During the second part of the study in total nine students and nine senior citizens took part in the three creative workshops, with six participants in each (two groups with three participants). Below are the details of the participants from the three groups:

DESIGNERS	Gender	Age	Occupation	Computer experience	Daily routine of computer use	Usage of computer in a day	Use of other technology
Yellow group							
Designer 1 (D1)	Male	32	HCS student	Advanced user	programming, producing websites, Internet, on-line shopping, Skype, research, editing photos	6 hours or more	mobile phone, laptop, Oyster card
Designer 2 (D2)	Female	29	Research assistant	Advanced user	for work, staying in touch with friends, searching for information, watching TV, downloading music & videos, online banking & shopping, booking holidays	6 hours or more	Blackberry, iPod, iPhone, Digital camera, laptop, TV
Designer 3 (D3)	Male	48	Programmer	Advanced user	reading news, e-mail, Microsoft Messenger, online shopping, purchasing services, research	From 15 min to 5 hours	Mobile phone, TV
Red group							
Designer 1 (D1)	Male	30	HCS student	Advanced user	Internet, research, study, social networking, communicating, listening to music, virtual learning, on-line banking	4 hours	Mobile phone, iPod
Designer 2 (D2)	Female	36	Information architect	Advanced user	e-mails, on-line shopping, studying, editing photos, video chat, studying, research, on-line social communities	From 2 to 3.5 hours	mobile phone, Sky TV, iPod, computer toys
Designer 3 (D3)	Male	33	Research assistant	Advanced user	work, e-mails, research, spread sheets, on-line banking and shopping, writing, Internet	6 hours	Hi-Fi and CD player, mobile phone

Table 22: The designers' personal details and their use of technology.

MIXED GROUP	Gender	Age	Occupation	Computer experience	Daily routine of use computer	Usage of computer in a day	Use of other technology
Yellow group							
Older person 1 (OP1)	Female	57	Teacher, Civil servant, now retired	Advanced user	e-mails, recording gas and electricity use, renewing books, downloading photos from digital camera, checking exhibition opening hours	From 1.5 to 2 hours	digital camera, printer, radio, TV, telephone
Designer 1 (D1)	Male	48	Software product manager	Advanced user	e-mails, on-line shopping, reading news, blogging, organizing golf competition, researching family history, studying, on-line social communities	Varied: 1 hour, evenings, all day	digital TV, mobile phone, video game console, printer, iPod
Designer 2 (D2)	Female	27	Research Assistant	Advanced user	on-line banking, booking flights, work, study, entertainment, communication, keeping informed	From 45 min to 7 hours	digital camera, mobile phone, iPlayer
Red group							
Designer 1 (D1)	Male	31	Researcher	Advanced user	work, e-mails, editing photos, entertainment, programming, navigation, presentations	3 hours	PDA
Older person 1 (OP1)	Female	63	Classroom Assistant now retired	Beginner	playing computer games, social networking (SAGE), reading news, basic writing, on-line shopping, reading blogs	From 3 to 4 hours	mobile phone, TV, DVD, digital camera
Older person 2 (OP2)	Male	65	TV rental installer & marketing buyer, now retired	Mild user	e-mails, internet, editing photos, writing	From 30 min to 3 hours	printer, mobile phone, digital camera

Table 23: The mixed groups' personal details and use of computers and other technology.

OLDER PEOPLE GROUP	Gender	Age	Occupation before retirement	Computer experience	Daily routine of use computer	Usage of computer in a day	Use of other technology
Yellow group							
Older person 1 (OP1)	Female	61	Various administrative jobs	Mild user	writing letters, for presentations, publishing, editing photos, e-mails	7 hours	scanner, photocopying machine
Older person 2 (OP2)	Female	75	Working on database for Hoxton Health	Mild user	editing photos, animation, working with databases, e-mails, Internet	from 20 min to 1 hour	Wii games console, TV, radio
Older person 3 (OP3)	Male	78	Teacher	Mild user	spread sheets, Internet, e-mails, listening to music, watching TV, crosswords	1-3 hours	TV, digital camera, video recorder
Red group							
Older person 1 (OP1)	Female	74	Primary school teacher	Mild user	writing letters, editing photos, on-line shopping, working with spread sheet, listening music, publishing	from 10 to 3 hours	bread maker, cooking equipment, TV, radio, mobile phone, CD player, VCR
Older person 2 (OP2)	Male	65	Community social worker	Mild user	communication, education, writing reports, designing posters	from 30 min to 5 hours	Printer
Older person 3 (OP3)	Female	60	Various clerk jobs	Mild user	e-mail, Internet, on-line banking & shopping, booking travel, watching TV, writing letters, phone calls	from 4 to 6 hours	TV, VCR, mobile phone,

Table 24: The older people's personal details, use of computers and technology.

7.2.3 APPARATUS AND MATERIALS

Study 3 used as more or less the same apparatus and materials; however, a different space was used for conducting the creative workshops. The apparatus, materials and space were as follows:

1.) Apparatus

- a.) Video camcorder (2 pieces) with video camcorder tapes
- b.) Tripod (2 pieces)
- c.) Digital camera for taking stills during the creative sessions (2 pieces)
- d.) Dictaphone for recording interviews after the Cultural Probes study and for gathering data during the creative workshop (2 pieces)
- e.) Laptop and projector for projecting the Power Point presentation
- f.) Interactive Smart board for delivering Power Point presentation

2.) Materials

The same materials were applied as in the pilot study (see section 5.2.3).

3.) Space

This time, all the creative workshops were delivered in the Focus Room in the Interaction laboratory at City University London (see Figure 62). The participants were assembled behind two tables and were named, in order to make analysing data easier, the Red and the Yellow groups. The facilitator used a small table for delivering instructions, workshop materials (for example, Creative Cards, and 'Magic boxes') and to separate the groups.

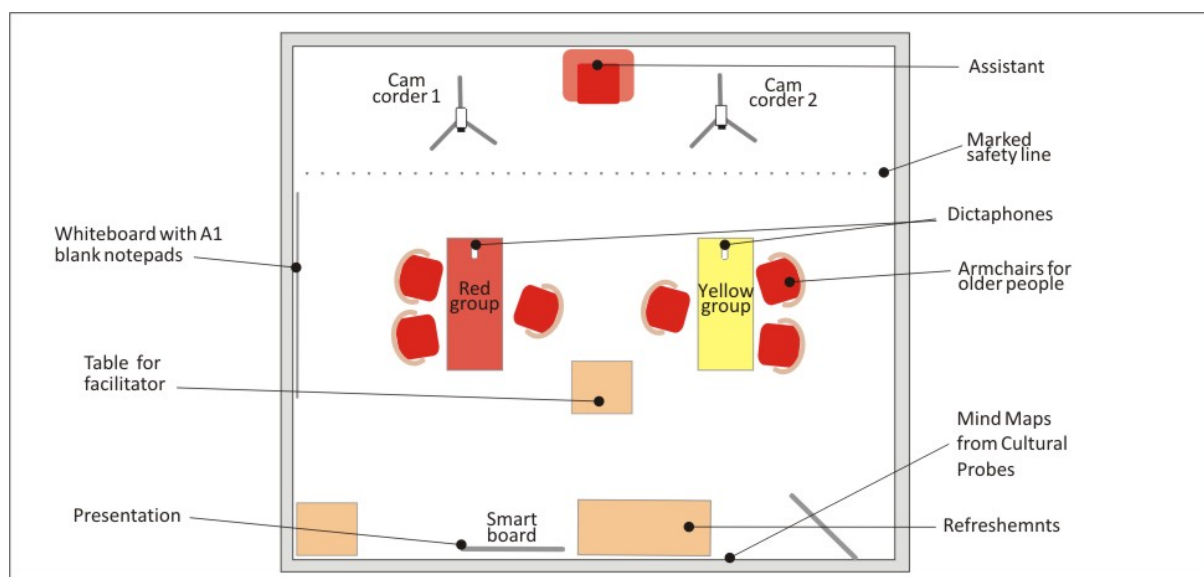


Figure 62: Set up for the creative workshop: all three creative workshops had the same setting and were conducted in the focus room.

Armchairs were supplied for the older members of the groups. The assistant was placed in the background where both video camcorders also stood. The space where the camcorders (fixed on tripods) stood was marked out for safety reasons. The content of the creative workshop was delivered by a Power Point presentation on the Smart board. Refreshments were available for participants throughout the workshop.

7.2.4 PROCEDURE

Each creative workshop had the following stages (see the Pilot study chapter or Table 10):

a.) Recruitment

Designers and older people were recruited by the initial/introductory presentation, which had a snowball effect, as participants involved advertised the study to friends and colleagues. However, researchers were recruited via personal contacts and e-mail.

b.) The preparation stage with Cultural Probes method

The main aim of the Cultural Probes was to mentally prepare participants for activities in the creative workshop by thinking how, where and when they used a computer, as well as imagining for what other purposes they might want to use one. Therefore, by working through the Probes, participants were asked to complete a workbook and to develop a mind map, which illustrated their relationship with a computer, then answer a questionnaire and maintain a seven-day diary about how they used their computer.

The results from the Cultural Probes on their use of computers and other technology are presented in Tables 23, 24 and 25. In addition, the mind maps that present the participants' relationship with their computer are displayed in Appendix 12.

c.) The interview

When the participants finished the first part of the study they were invited to explain their work, thoughts, drawings and mind maps in the Cultural Probes. At the same time they had a chance to meet the facilitator and see the place where the creative workshop would be held.

d.) The creative workshop with the applied Poincaré creative process

The creative workshop followed the first part of the study, with the following stages (see Table 23):

- The preparation stage

After the reception and the introduction participants received their instructions for the study. The Cultural Probes previously completed by the participants were displayed on the wall. Participants watched a brief presentation outlining the structure of the workshop. The workshop started with an icebreaker, where participants had a chance to get to know the other members of the group.

- **The incubation stage**

In this stage participants were first shown a slide on removal of mental blocks. Then, they were given a scenario, based on which they had to design a digital device that would assist older people in their everyday activities. During the brainstorming sessions participants were assisted by Creative Cards (see section 6.2.2.2) and with five questions (see Table 25). At the end of this session participants voted for the best idea, after which lunch followed.

- **The illumination stage**

After lunch participants built a paper prototype and had the opportunity to use worksheets and apply “Tell me”, “Make it” or “Draw it” methods. The session finished with a talk where the participants from each group presented their final paper prototype to the other group.

- **The verification stage**

During this stage participants were required to answer the questionnaire relating to the facilitation and evaluate their own and the other group’s ideas in terms of novelty and appropriateness.

The timetable and content of the creative workshop		
Time	Stage in the process	Working material
09:30	Reception (with coffee and tea)	
10:00 10:15	Preparation Ice Breaker	What is your partner’s name? What does your partner do in his/her free time? What is your partner’s favourite device? What is your partner’s most pleasurable experience with their favourite device?
10:30	Incubation Removing mental blocks	Slides presenting Roger von Oech’s mental blocks
	Scenario	<i>"You are a designer in a company named IDEA. IDEA have been given the task to design a device for a company called GLOBAL DIGITAL, who produce various devices, tools and products for different European countries. You have been asked to design a new digital device that will address senior citizens’ everyday needs."</i>
	Brainstorming with Creative cards to discover new ideas	Creative cards , used to answer the following questions: - What will the device do? - When will the device be used? - Where will the device be used? - How will the device be used? - Anything else?
	Voting for the “Golden Idea”	
12:00	Lunch Break	
13:00	Illumination Build a paper prototype using three methods Presentation of the final design	Worksheets to implement the three approaches: - Tell me - Draw it - Make it (‘Magic box’)
14:15	Verification The most novel and appropriate idea	
14:30	End	

Table 25: Procedure for Study 3.

7.3 RESULTS

This section is divided into three parts. In the first part, the results from analysing the data obtained during the creative process will be presented, and in the second part data obtained from evaluating the final output will be displayed. The third part reviews the groups' performance in terms of group dynamic and method use.

Below are presented and described the creative output from all six groups.



Figure 63: The designers groups' final output: the designers' red group built a device that promotes fitness and exercise for the older population as illustrated in images 1 to 4; whereas the yellow group built an electronic photo frame called *"Keep me in the picture"*, which besides sharing photos also connected people (see photo 5).



Figure 64: The mixed groups' final output: the mixed yellow group designed a digital and analogue calendar (see photo 1); while the mixed red group developed an electronic teacher that helps older people with daily problems (see photos 2 and 3).



Figure 65: The older people's groups' final output: the older people's yellow group built a GPS navigation system for an electric car that could also tell you when to change gear (the prototype presents a driver in the car – see photos 1 and 2), while the older people's red group designed a massage chair, as shown in photos 3 and 4.

7.3.1 ANALYSIS OF THE CREATIVE PROCESS

During the creative process two types of data were analysed, topics and turns, in order to measure Guilford's factors, and factors that stimulate and inhibit creativity. The results of the study are presented below, and shown in overview in Figure 66.



Figure 66: The final results from all six groups in Study 3. In the photo are indicated the differences in numbers of topics between the older people, the mixed and the designers' groups (for additional information see Appendix 15).

a.) Topics and turns

The mixed groups developed the highest total number of topics (20 and 25 topics), which means that these groups had a high flexibility of ideas (see Table 27 and Chart 1). These groups had as well a high number of turns (491 and 604), which means a high level of flow (see Table 27 and Chart 2). Both mixed groups developed the lowest average number of turns per topic (24). However, there were no major differences in terms of average length of topic among the groups. Finally, it is noticeable that the designers' yellow group had more than 14 minutes of silence.

PROCESS	Designers		Mixed group		Older people	
	Yellow group	Red group	Yellow group	Red group	Yellow group	Red group
Total number of topics	12	10	20	25	13	14
Total number of turns	298	353	491	604	424	513
Average length of topic	2.59 min	4.43 min	3.06 min	2.26 min	3.25 min	2.23 min
Average number of turns per topic	25	35	24	24	33	37
Total time of silence	14.23 min	5.09 min	4.02 min	0	0	0

Table 26: The total number of topics and turns for all groups. Chart 1 highlights differences in total number of topics, while Chart 2 shows the total number of turns (see next page).

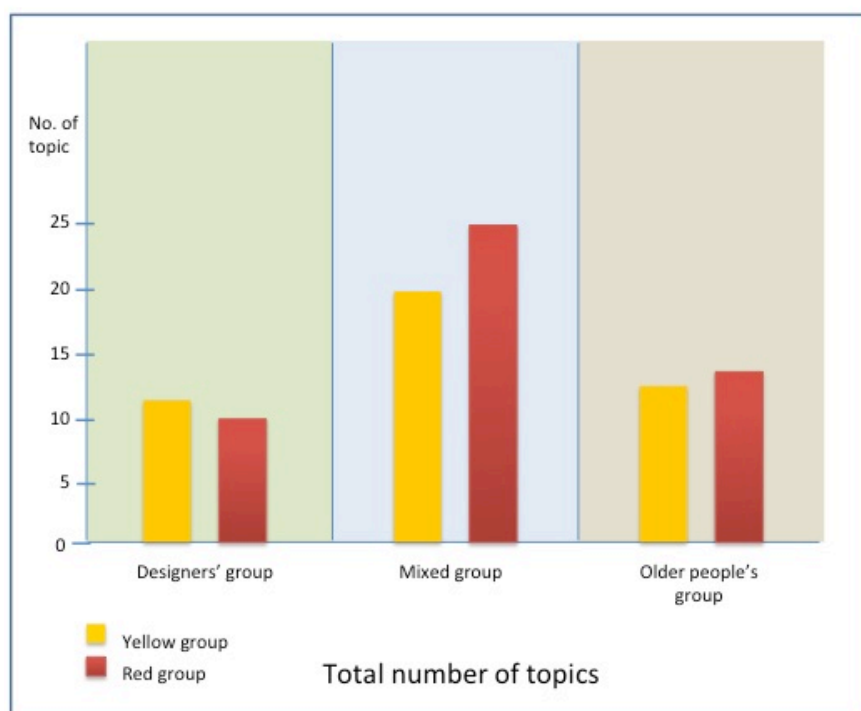


Chart 1: The chart illustrates the higher number of topics and high flexibility in the mixed groups, in comparison to both the designers' and older people's groups (see Table 26).

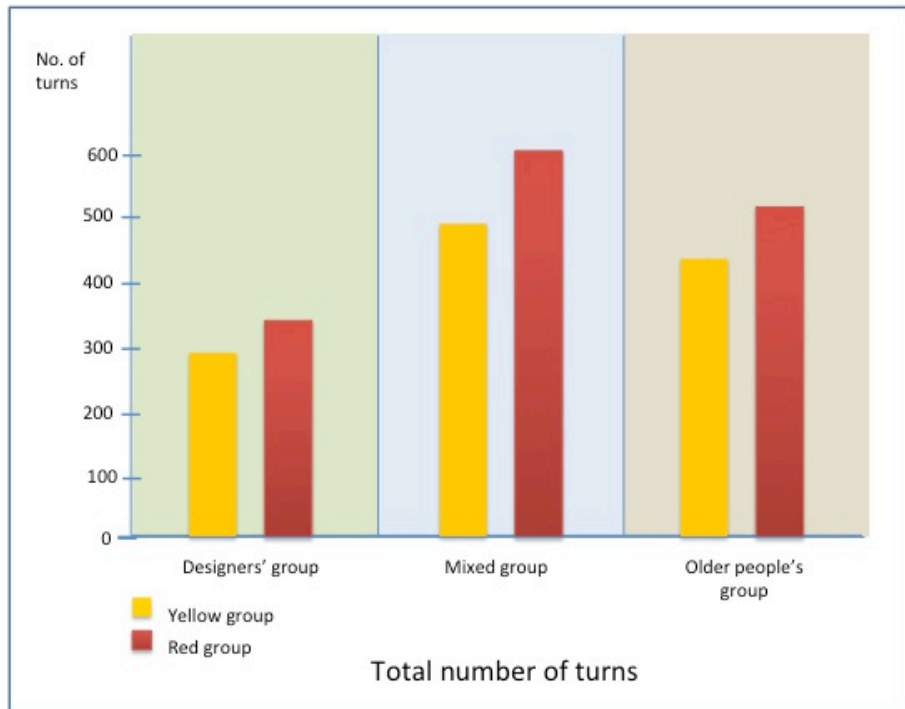


Chart 2: The total number of turns and high levels of flow in the mixed groups (see Table 26).

b.) Factors that stimulate creativity

Both mixed groups had a higher total number of stimuli (67 and 66) than the designers' (29 and 28) and older people's groups (34 and 20) (see Table 27 and Chart 3). Firstly, if we look at Paulus's (1999) factors that stimulate creativity, both of the mixed groups gained the highest number of '*viewing different options*', as well as '*conflict*' ('*positive disagreement*'). This might contribute to the complexity of ideas, since these groups (especially the yellow group) produced the highest amount of '*complex ideas*' (see Table 27). In contrast, the designers and the older people's groups had very low numbers of these stimuli, in particular '*positive disagreement*'. Secondly, stimuli based on the methods that the participants applied during the creative process did not have any obviously different influence on the production of ideas in different groups. The "Make It" method greatly stimulated participants in the incubation stage, especially older people's groups, the designers' yellow group and the mixed red group. Finally, participants in the mixed groups had more opportunity to draw inspiration from their life experiences and technology than participants in similar groups.

PROCESS	Designers		Mixed group		Older people	
	Yellow group	Red group	Yellow group	Red group	Yellow group	Red group
Total number of stimuli of each kind that were used by each group						
Paulus stimuli						
Viewing different options	2	5	16	12	0	2
Complex ideas	2	2	12	4	1	0
Conflict (positive disagreement)	0	0	5	8	0	0
Factors that stimulated ideas based on applied methods						
Stimulus from questions on worksheets	6	10	5	4	8	4
Stimulus from materials – ‘ <i>Magic box</i> ’	11	2	5	10	13	12
Stimulus from ‘ <i>Draw it</i> ’	3	1	0	8	0	1
Other stimuli						
Stimulus from technology	5	5	10	13	8	1
Stimulus from life experiences	0	3	14	7	4	0
Number of different types of stimuli	6	7	7	8	5	5
Total number of stimuli	29	28	67	66	34	20

Table 27: A summary of the factors that stimulated creativity in the designers, mixed groups and older people. Chart 3 emphasizes the significantly higher total number of stimuli in the mixed groups.

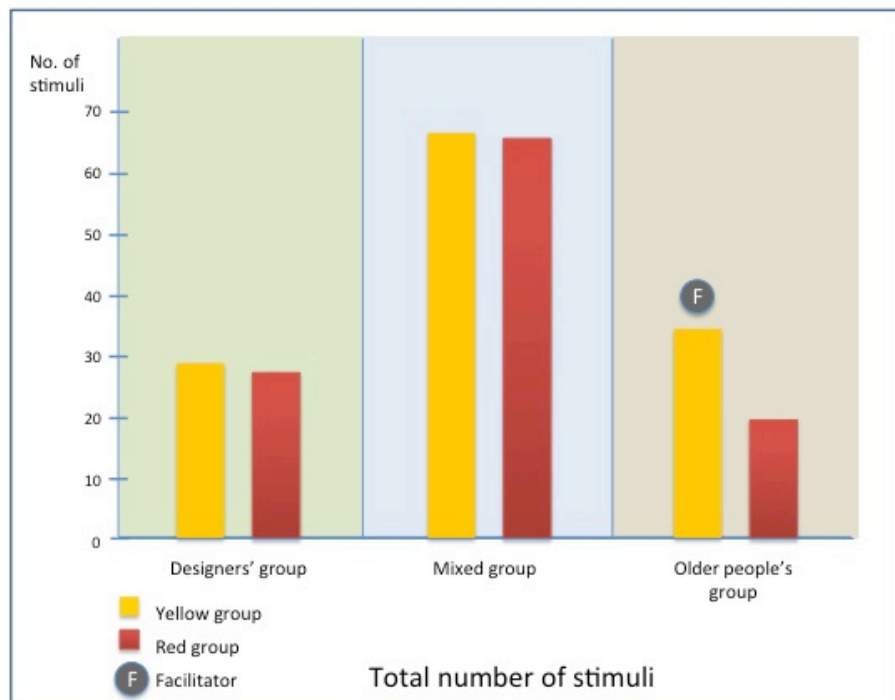


Chart 3: The chart presents the total number of stimuli: the mixed groups developed the highest number of stimuli (see Table 27). The yellow older people's group had a high number of stimuli mainly because of the facilitator's assistance.

c.) Factors that inhibit creativity

Both older people's groups had the highest number of factors that inhibited creativity (20 and 32) (see Chart 5), as well as different types of blocks (7 and 7) (see Chart 4). The older people had the highest *confusion* identified (because of unclear instructions). They also had problems with concentration as the highest number of *off topics* (they were often chatting about issues which were not relevant to the creative workshop) was identified in these groups. A high level of *conflict* was also indicated (see Table 28). Finally, it was acknowledged that the facilitator was a disturbing factor for all 6 groups. The reason for this was that the facilitator delivered additional information and reminded participants about the time left.

PROCESS	Designers		Mixed group		Older people	
	Yellow group	Red group	Yellow group	Red group	Yellow group	Red group
Total number of blocks of each kind for each group						
Facilitator and Assistant interrupted creative process						
Facilitator	1	2	5	5	2	3
Assistant	0	0	0	0	3	11
Other blocks						
Conflict (Paulus)	0	0	0	0	5	3
Confusion	0	0	0	0	7	3
Off topics	0	0	0	0	1	7
Physical needs						
Toilet	0	0	0	0	1	3
Refreshments	0	0	0	0	1	2
Number of different types of blocks	1	1	1	1	7	7
Total number of blocks	1	2	5	5	20	32

Table 28: A summary of the factors that inhibited creativity in the designers', mixed and older people's groups. Chart 4 emphasizes the number of different types of blocks in groups, whereas Chart 5 emphasizes the significantly higher total number of blocks in the older people's groups.

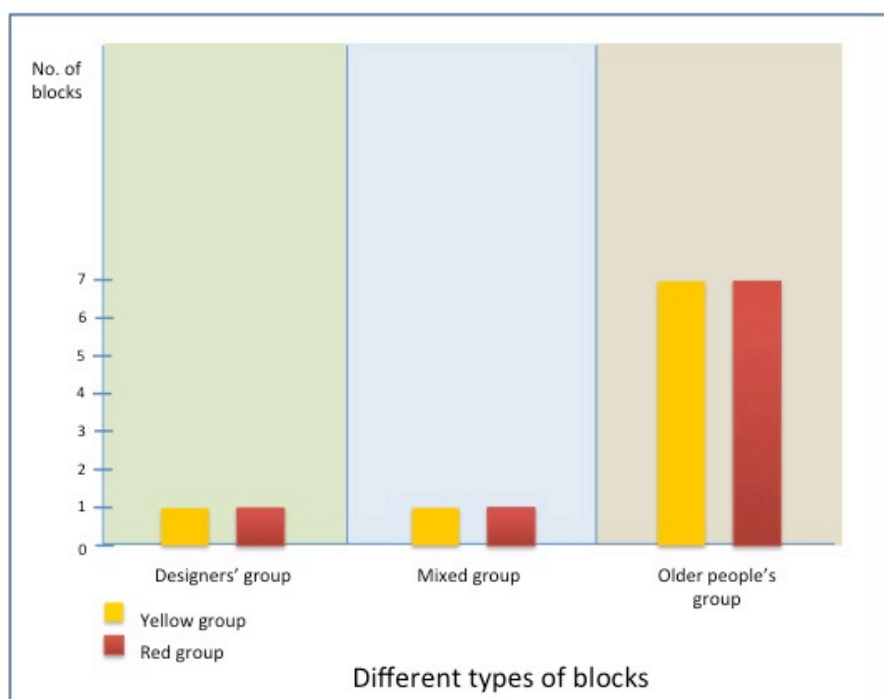


Chart 4: This chart presents the total number of different types of blocks: the older people's groups had the highest number of different types of blocks that inhibited creativity in comparison to designers and mixed groups (see Table 28).

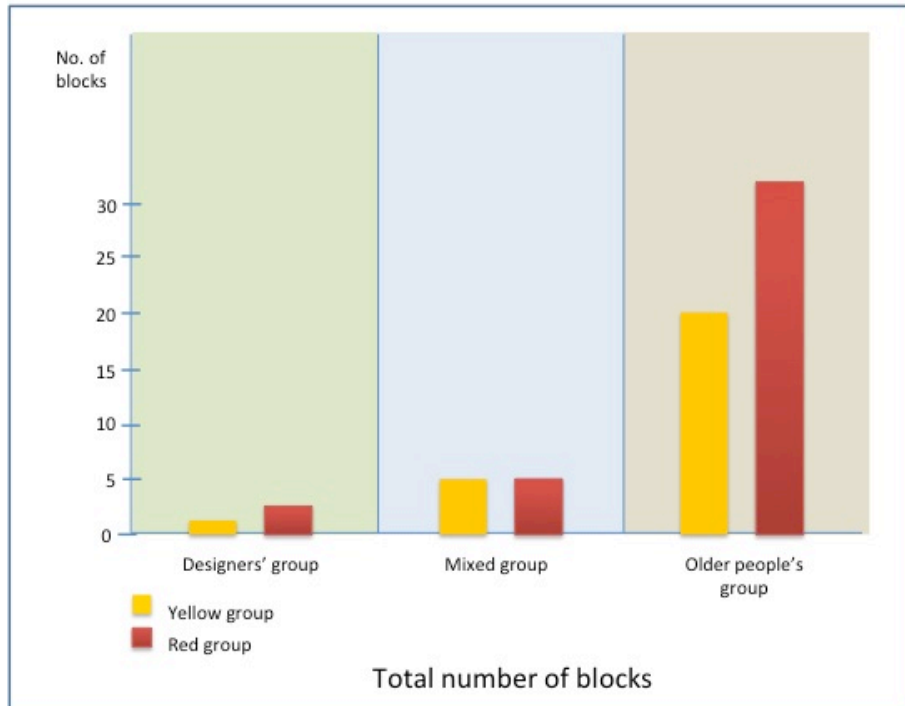


Chart 5: The chart presents the total number of blocks and demonstrates that the older people's groups had the highest number of blocks in total (see Table 28).

7.3.2 ANALYSIS OF CREATIVE OUTPUT

The two experts evaluated the novelty and appropriateness of the six paper prototypes. There is some suggestion in the results that the designers' groups may have developed more novel ideas in comparison to the mixed and older peoples' groups (see Chart 6). In terms of appropriateness there is some suggestion in Chart 7 that the mixed groups developed more appropriate products in comparison to the designers' and older people's groups.

7.3.2.1 NOVELTY

Additional comments from the experts regarding the novelty of the paper prototypes were as follows.

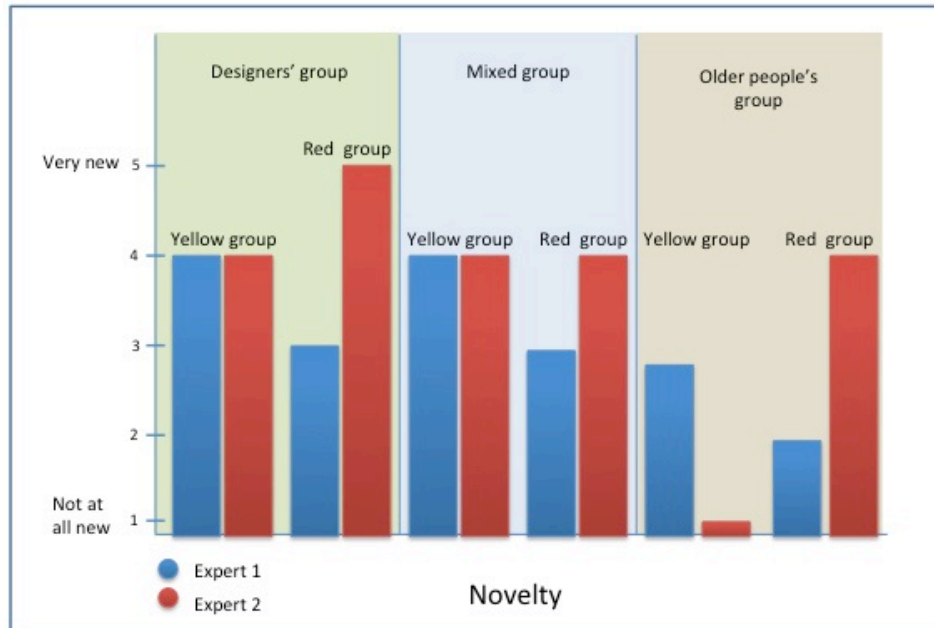


Chart 6: This chart represents the novelty of the final output across all groups. The final output from the designers' and mixed groups was more novel in comparison to older people's groups.

a.) The designers' groups

The second expert was convinced that the fitness and exercise device of the designers' red group was very novel (5), since *"it registers movement of any type, can be worn on different parts of the body, you can compare your attainment with others, and it could be used to simulate activities (e.g. hiking) in a nursing home"*.

b.) The mixed groups

The second expert did not see the idea as novel, *"but combining it with spoken reminders and sensors that you can stick on equipment is interesting"*. The electronic teacher (see Figure 64, photo 2 and 3) of the mixed red group was good, but the first expert thought *"it is just a simplified version of something in existence"* since the idea was too similar to the iPad to be novel³⁶.

c.) The older people's groups

The experts agreed that the devices (GPS navigation system and massage chair) (see Figure 65, photos 1 to 4) designed by the older peoples' group already existed on the market. The second expert liked the massage chair idea from the older people's red group (see Figure 65, photo 3 and 4); this expert believed that idea was not that novel, *"but the combination is fairly novel and there are some interesting features (e.g. temperature controlled)"*.

³⁶ The creative workshop was conducted one year before the iPad appeared on the market; however, the group developed their paper prototype based on the iPhone that the designer owned.

7.3.2.2 APPROPRIATENESS

Additional comments from the experts regarding the appropriateness of the paper prototypes were as follows (see Appendix 16).

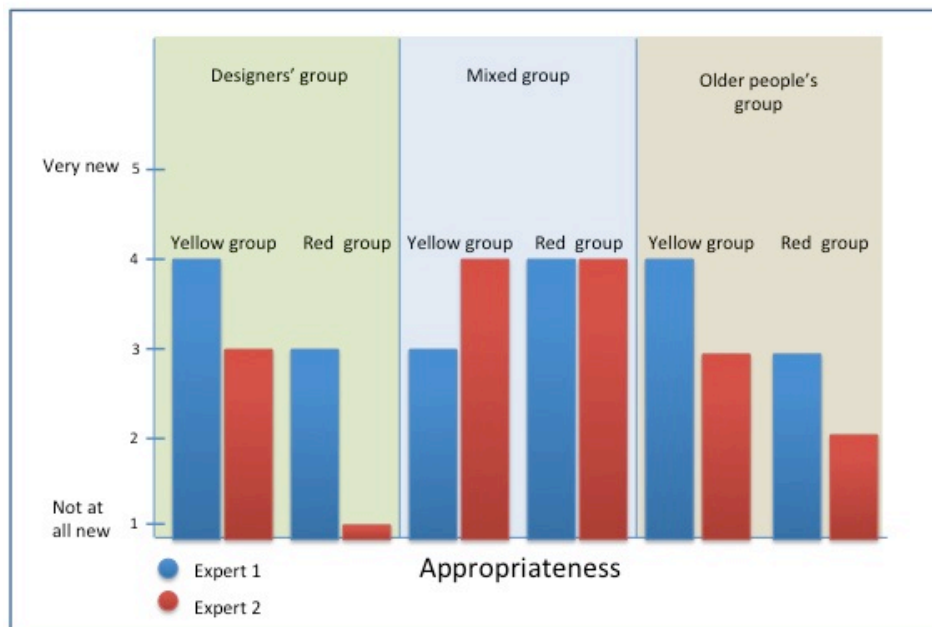


Chart 7: The chart shows the appropriateness of the final output in all groups. Experts thought that the mixed group's ideas were the most appropriate in comparison to the other four groups.

a.) The designers' groups

The first expert saw the yellow group's electronic photo frame (see Figure 63, photos 5) as very appropriate and possible to integrate into the home, as many of the needs of older people had been considered with this device; however, the expert had two reservations. First, how the user will choose with whom to talk, and second, the menu system might be difficult for older people to use. In addition, both experts pointed out that they had some problems with understanding interaction with the device.

The first expert was not certain whether older people would want to use the exercising device from the red group of designers (see Figure 63, photos 1-4), as most pedometers do not get used, but from a social interaction viewpoint the device could be useful. The second expert thought that the basic idea of encouraging fitness in older people was good, but this expert found the interface very complicated and abstract, since the user's progress is represented with beans (see Figure 63, photo 3). In addition, this expert was not convinced of the way the device would encourage social

interaction by comparing someone's achievement with other people's; therefore, it might be better to use existing ways of communication.

b.) The mixed groups

The electronic calendar (see Figure 64, photo 1) of the mixed yellow group was seen by the first expert as interesting and they liked the user's interaction with the device. However, the expert thought that it *"would be difficult to implement smart technologies into many people's houses"*. The second expert was certain that screen interaction might be a little difficult, but it would depend on the details, which should be very similar to a conventional calendar. It would be convenient to have a calendar placed somewhere in the house. The second expert thought that red group's electronic teacher (see Figure 64, photos 2 and 3) would be useful if all practical considerations were taken into account. The second expert understood it as a *"fairly simple device, focused on just one function, with a simple interaction"*.

c.) The older people's groups

The first expert thought that it would be very difficult and expensive to implement and use the voice control in the car for the yellow group's device (see Figure 65, photos 1 and 2). The second expert thought that the navigation system would be dependent on usability, how the details were designed, and what specific functions in addition to navigation it would have. Besides that, the expert was not convinced that telling the driver when to change the gear would be useful, as by the time the user needed to do that it would be rather too late, and the user might have an automatic car. The second expert was convinced that this kind of massage chair (see Figure 65, photos 3 and 4) from the older peoples' red group would be prohibitively expensive, and it would discourage older people from moving around and getting necessary exercise. Finally, the expert thought that the usability would be highly dependent on the controls.

7.3.3 ANALYSIS OF GROUP PERFORMANCE

In this section the group dynamic and the use of methods in each group during the design process will be presented. In relation to group dynamics, particular attention is paid to: whether group members were working as individuals or collaborating with fellow group members; whether there was conversation or silence; when there was co-operation, and when conflict; when participants built on each other's ideas, and when they blocked them. Examples of confusion and off topic conversations are reported where they happened. Some description is also given of the methods

used by each group, with particular attention being paid to the methods used in the illumination stage.

7.3.3.1 DESIGNERS' YELLOW GROUP

This group was designing an electronic photo frame called “Keep me in the picture”, which besides sharing photos also connects people. The group built their idea on existing technology of the possibility of downloading e-books from Amazon in order to develop their idea. At the beginning the group discussed the device’s visual appearance, in order to design it for a broader audience (mass customisation). Work in this group was divided: D1 (Designer 1) drew sketches, D2 brainstormed potential names for the device and D3 built a model (see Figure 67, right). The group worked on worksheets answering questions, for example *“What will the device do, When and where will the device be used”*; after a short discussion the group decided on a name for the device. Following that, the group worked on the situation where the device would be used and how people would interact with it. Overall there was a lot of silence during the design process in this group (for more on the group dynamic see Appendix 15.1).

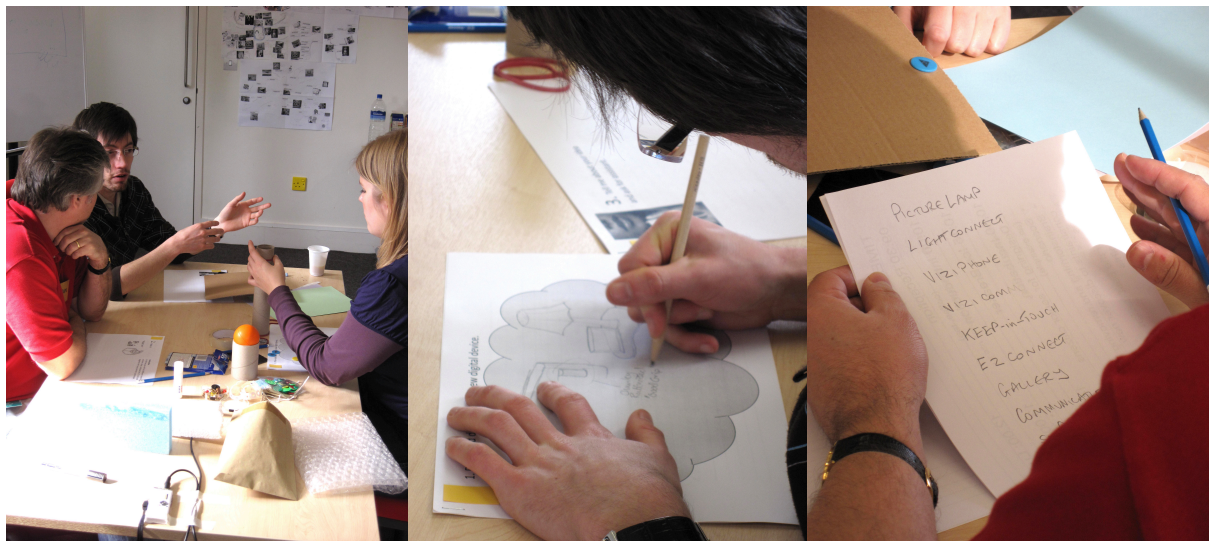


Figure 67: The Designers' yellow group divided their work up amongst their members: D3 made the model (left), D1 drew sketches (middle) and D2 brainstormed names for the device (right).

In terms of methods, two designers were working on worksheets during the illumination stage: D1 worked on questions that were on the worksheets (Figure 68, left) and drew a storyboard (see Figure 67, middle), as D2 brainstormed different names for the device (see Figure 67, right). All three designers were interested in exploring and playing with the materials from the 'Magic box': for example, D1 used some cardboard from the 'Magic box' to present the dimensions of the device, and, D3 built a model using materials from the box on their own.

Describe your idea

1. The name of this new device is... Keep me "IN THE PICTURE"

2. What does it do?
Presents pictures received
Pictures can be "moving" and "audio"
Can send as well as receive
Option to initiate a phone call
Option to initiate a video call

3. How will you use it?
The frame will be mounted on a sturdy base that provides a light (via lamp) and a power clocking
The picture is device can be moved around with power controls. Communication can be receive send or both.

4. When and where will you use it?
In the house, moved from room to room.
The lamp frame lights up when receiving

7. Describe one unique situation that this new device will be used and how?

Draw

● Situation Grand friend receive
"Mum". Little johnny's first
words. Initiate short call.
Look back at memories.

● How Button pressed to
push through "pictures
of button to call.

Figure 68: An example of completed worksheets, answered questions (left) and storyboard (right) from the designers' yellow group.

7.3.3.2 DESIGNERS' RED GROUP

This group was designing a device which promotes fitness and exercise among the older population. There was some silence at the beginning, then the group started to discuss different possibilities, for example what the look of the actual device would be. The group suggested many forms of device such as a brooch, a walking stick or that maybe the device would not be visible at all. Then, the group discussed whether it would be used for indoor and outdoor fitness and if it might be wearable. After that, the group went back to the whiteboard (where Creative Cards were left from the incubation stage) to get some more ideas. The group discussed where on the body the device would be placed and thought of existing technology, such as a pedometer, which they could connect to special trainers and a Wii games console. In addition, the device would show walking speed and distance, path, time and goals achieved, suggest breaks, and the user would earn rewards after achieving goals. Then, the group debated different names for the device and discussed when the device would be used (for example when walking, dancing, and gardening). However, they were also thinking about designing a game, which would inspire older people to exercise more. During the design process, the group laughed and used the upper part of the body to present where the device would be placed (for more on group dynamics, see Appendix 15.2).

The group used the worksheets a great deal, discussing the questions and the scenario (see Figure 69). D1 wrote and drew a storyboard on the worksheets, most of the time consulting with the other two designers.

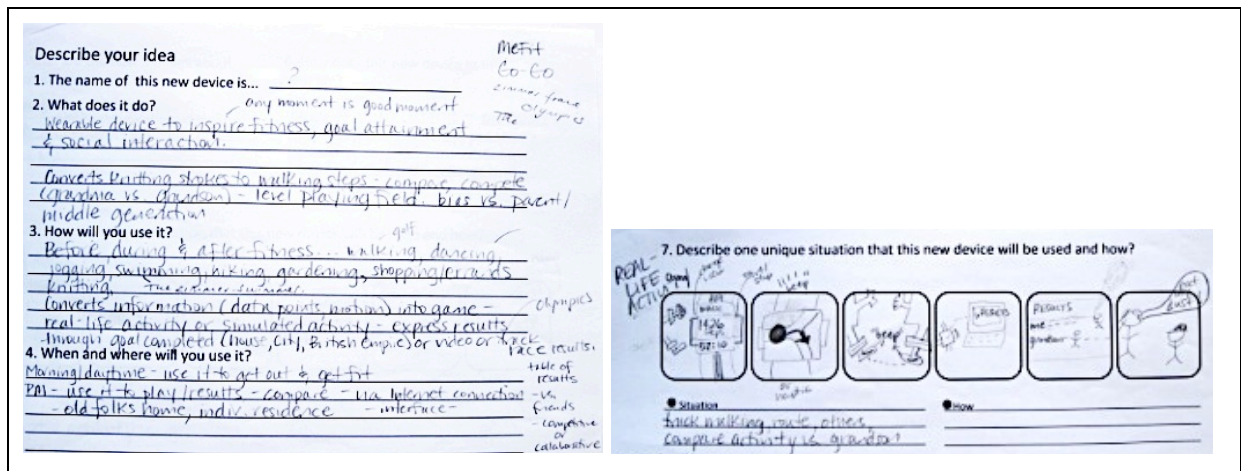


Figure 69: An example of filled worksheets from the designers' red group: answered questions (left) and storyboard (right).

This group was very excited about the contents of the 'Magic box'. All three members enthusiastically explored the materials. However, the group only started to build their paper prototype in the final 10 minutes. D3 made plastic glasses from the packaging (see Figure 70, middle) and a doll, as D2 built a model of a device that you could wear on your wrist and an interaction platform (see Figure 70, right).



Figure 70: Designers' red group shared their work among the members: D1 answered questions and drew a storyboard (left) and D3 made glasses (middle), as D2 was making a hand-device and an interaction platform (right).

7.3.3.3 THE MIXED YELLOW GROUP

This group worked on the idea of a digital and analogue calendar. They had extensive and lively conversation during the entire design process (see Appendix 15.3). D1 started a group conversation on how people use calendars. OP1 changed topic and suggested designing a calendar that would help people with memory problems (dementia). After that the group spent some time discussing what the physical appearance of the device would be. However, they came back to talking about designing a calendar that would be an active reminder for people with memory problems, reminding them to take medication and supporting independent living.

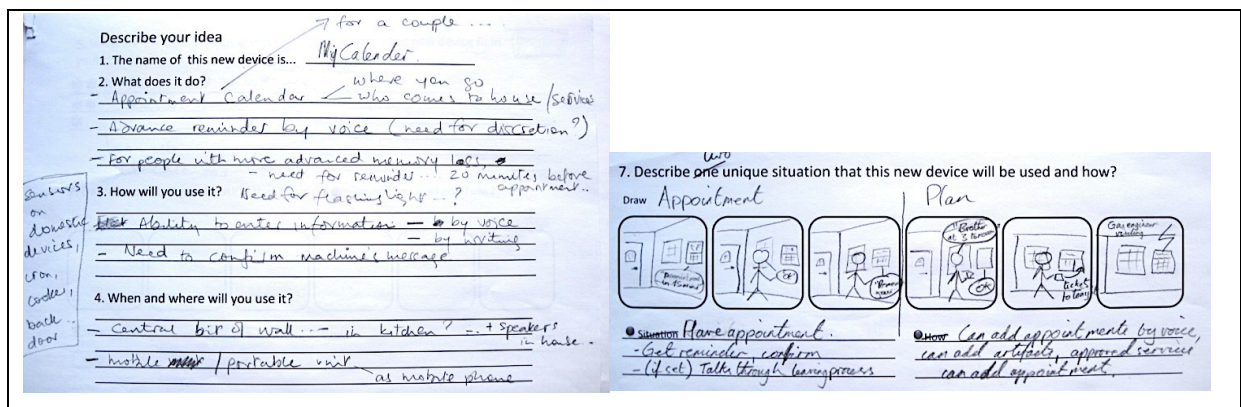


Figure 71: An example of completed worksheets from the mixed yellow group: answered questions (left) and storyboard (right).

In terms of methods, OP1 read a question from the 'Draw it' worksheets: 'What are the best 3 things about your new idea'. D2 said that the device should reduce anxiety, for example, whether an iron was unplugged or not, and suggested "magic sensors" which would detect what was happening in the room. All of them agreed that the device should be integrated into the user's life, and that the interface should only be an extension of what people already know. D2 built the model and OP1 commented on the model's details, while D1 filled questions in the worksheets. While participants were working on several questions at the same time they used worksheets to answer questions, such as *what will the device do, what would the communication with device be, where would the device be based, how will the device be used, would a person talk or write on the calendar, how would you check if a person was reacting to the device and where would the device be located* (see Figure 71, left).

All group members were very excited when they were exploring the materials in the 'Magic box'. The older person started to play with the materials and made a tower out of them (see Figure 72, left). The group built the model in the last ten minutes of the session, although participants also

used materials from the 'Magic box' during their earlier conversations to demonstrate the examples of design that they were talking about.



Figure 72: The mixed yellow group had lively discussion during the creative workshop (middle). OP1 was very excited about the contents of the 'Magic box' and she made a sculpture (left) as, D2 was working on a paper prototype.

7.3.3.4 THE MIXED RED GROUP

This group was working on an electronic teacher that would help older people in their daily routine. The main characteristic of this group was its very productive and dynamic discussion (see Figure 74). The designer (D1) suggested using a TV screen and what the different possibilities for this kind of device would be. OP1 and OP2 listened, but then said that its use did not need to be that basic, and expressed their own ideas. After that, D1 showed OP1 and OP2 how an iPhone works and OP1 and OP2 expressed their comments on how this could be applied in their lives. The participants firstly demonstrated what the interaction with the model would be and then D1 started to draw different sketches of the device, showing interaction with the device, what buttons the device would have and how the screen would look (see Figure 73).

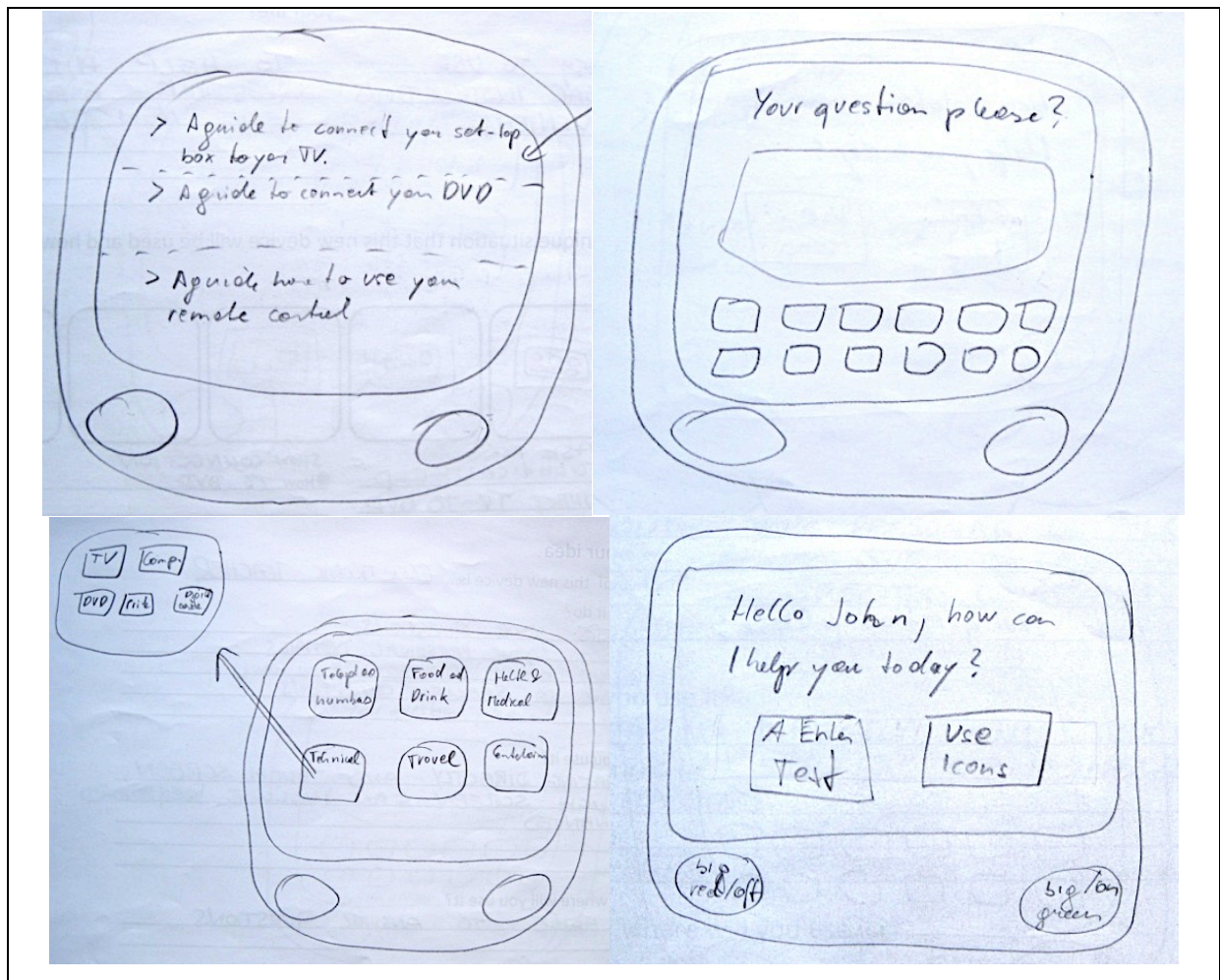


Figure 73: Example of the mixed red group sketches of interaction with the device.

OP2 demonstrated what the interaction with the device would be, and suggested some topics that could be presented with different controls. D1 drew sketches (see Figure 73), and OP1 and OP2 started to test materials from the 'Magic box' that would be used later on for building the prototype. During the session there was a lot of discussion among the participants, a positive attitude and laughter (see Figure 74, for more on group dynamics see Appendix 15.4).



Figure 74: The mixed red group had very lively and intensive discussion (left); D1 and OP1 debated and worked on the prototype (middle), while OP2 was filling the worksheets (right).

Worksheets were read and filled at the end of the session by OP2 (see Figure 75). At the first view of the 'Magic box' OP1 and D1 explored the materials and arranged them on the table; OP1 and D1 were laughing, as they were excited. The group started to build the model ten minutes before the end of session when the facilitator reminded the participants to start to build the model. All three members were involved in building the model; however, D1 and OP1 did the main work.

<p>5. What are the best 3 things about your new idea.</p> <p>*** EASY TO USE ** CLEAR INSTRUCTIONS * CONVENIENT</p> <p>6. How does this new device fit in your life?</p> <p>TO HELP WITH QUESTIONS ESPECIALLY ABOUT NEW TECHNOLOGY</p> <p>7. Describe one unique situation that this new device will be used and how?</p> <p>Draw</p> <p>SWITCH ON TV ASK FOR TECHNICAL HELP HOW TO CONNECT TV TO DVD</p> <p>ASK FOR HELP WITH TV</p> <p>SHOW CONNECTION/ HOW TO DVD AS TEACHER TO SHOW YOU DIAGRAM.</p>	<p>Describe your idea</p> <p>1. The name of this new device is... <u>ELECTRONIC TEACHER</u></p> <p>2. What does it do?</p> <p>ANSWERS YOUR QUESTIONS</p> <p>A) ABOUT YOUR PERSONAL DETAILS B) ABOUT OTHER SUBJECTS (EVEN LEADS) C) REPLY TO SPECIFIC QUESTIONS</p> <p>3. How will you use it?</p> <p>SPEAKING DIRECTLY AND TOUCH SCREEN. TOUCH SCREEN CAN INCLUDE KEYBOARD IF WANTED.</p> <p>4. When and where will you use it?</p> <p>MAINLY AT HOME TO ANSWER QUESTIONS</p>
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Figure 75: Example of participants' storyboard (left) and some answers to the questions (right) from the mixed red group.

7.3.3.5 OLDER PEOPLE'S YELLOW GROUP

This group was designing a GPS navigation system for an electronic car that could tell the user when to change gear. The facilitator needed to explain several times to the participants what they were required to do. As the group had problems with understanding the instructions and completing the design task, the facilitator decided to help the group. In addition, the assistant who was taking

photos distracted OP3. OP3 looked for his glasses and then started to read questions from the worksheets. OP3 was confused about what it was necessary to write on the worksheets.

In this group disagreement was noticeable, for example OP2 had a conflict with OP1 about the paper prototype, which they were planning to build. When facilitator asked, “*What will the device do in the car?*” the group disagreed about each other’s ideas. Therefore, the facilitator helped with additional questions such as ‘*What will the shape of the device be and where will it be positioned?*’ Afterwards, the participants could not reach agreement about the position of the device in the car. The facilitator and OP3 worked together on the worksheet and the facilitator further asked ‘*What will the interaction with the device be?*’ The facilitator then tried to convince OP3 to think about what the interaction with the device would be and if the device would have any switches (for more on group dynamics see Appendix 15.5). After 15 minutes of discussion the facilitator suggested, that OP1 and OP2 could start building the model. OP1 and OP2 made the entire car with the driver, rather than the actual device. At the facilitator’s prompting, OP3 then gave some comments on the model and made a prototype of the actual device.



Figure 76: The facilitator needed to take part in the older peoples’ yellow group, as the group was not able to complete the work on their own (left). OP3 and the facilitator worked together on the worksheets (middle), as the OP1 and OP2 were building a paper prototype (right).

This group was not capable of completing worksheets on their own, therefore the facilitator, with the help of OP3, completed the worksheet questions and storyboard.

At the beginning, materials from the 'Magic Box' were explored by OP1 and OP2, as they were planning to use them later on building a paper prototype (see Figure 76). OP2 showed what the size of the device would be with the Creative Cards. OP1 and OP2 disagreed about its visual appearance, but they did continue and finished the model. The group also used some plastic cups for car wheels from the refreshments table.

7.3.3.6 OLDER PEOPLE'S RED GROUP

This group was working on a massage chair. OP2 was a very influential person in the group, as she forced her idea forward to be built as a model. Everyone was doing something; all three participants were completely engaged and they worked as a group. There was some conflict between OP2 and OP3; however, they were working on a model together. OP1 observed and helped with the model from time to time (see Figure 78, left). Occasionally, participants were talking about topics which were not related to the creative workshop, such as their experiences as primary teachers, a popular TV series and telling jokes. Other than that, participants also discussed additional features of the model, for example a control unit, and they played with the model to see how it worked. All three participants were very happy making the model and OP3 said: *"This brings the child out of you for a couple of hours"* and *"Look! Collaborative action."* OP3 loved the model (possibly because the participants were building her idea) and she said that the model was like a Christmas gift. When OP1 and OP2 were decorating the prototype, OP1 said, *"That was the way the art and creativity came out"*; the participants were laughing and they were enjoying themselves. OP1 was tired at the end of the session; however, she finalised worksheets on her own quietly (see Figure 77), while the other two participants were chatting (see Figure 78, middle). For more on group dynamics see Appendix 15.6.

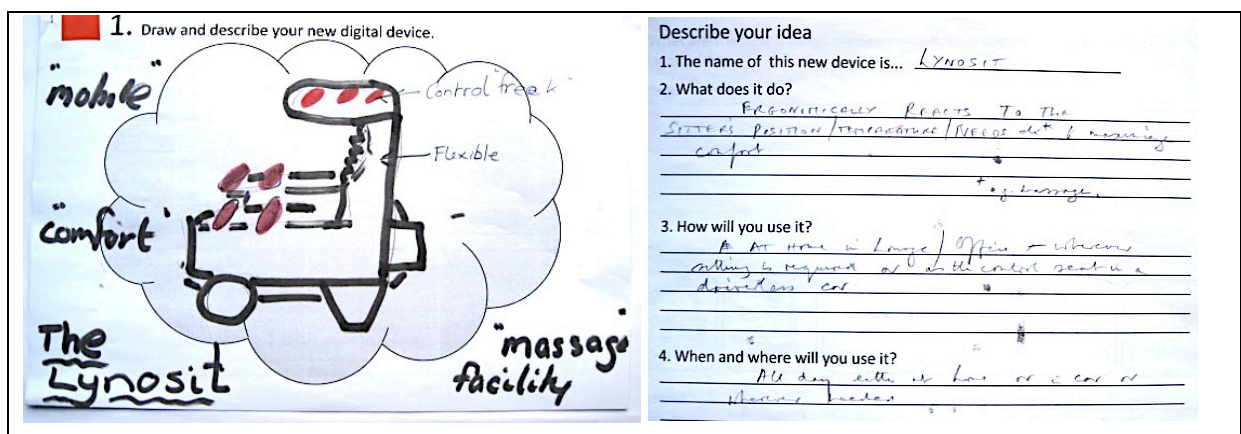


Figure 77: An example of the older people's red group sketches (left), and examples of how the group answered questions (right).

Ten minutes before the end of the session, when the facilitator reminded them, the participants focused on the worksheets. OP1 and OP2 discussed the questions as OP1 was writing on the worksheets (see Figure 77). OP2 refused to do the drawings, therefore OP1 continued, as OP3 did not want to do it either. OP1 struggled to understand how to draw the storyboard.

When the facilitator gave the participants the 'Magic box', they were not sure what to do with it and felt it was a little childish to play with the materials (see Figure 78, left). Nonetheless, OP2 and OP3 explored the materials in the box, although they were not sure what they had to do. OP2 and OP3 built a model, explored the materials and discussed which material could represent a certain part on the model, which was something all the participants enjoyed. OP2 was very engaged (and keener than at the beginning), for example he began to cut a cardboard tube with his own pocketknife. OP3 experimented with materials to use them for a headset and even became engaged in selecting different materials for the paper prototype. The participants tried various materials to make the chair rock back and forth. Blu-Tack, pins and tape were used for this. At the end OP1 designed a card with the name of the chair, while OP2 discussed with the other members where and how the chair would be used.



Figure 78: The older peoples' red group did not work very effectively together. At the beginning of the workshop participants were not sure what to do with the 'Magic Box' (left). OP2 and OP3 worked on the model while OP1 was answering questions on the worksheets (left and middle).

7.3.4 THE EFFECTIVENESS OF METHODS USED

This section will reflect on the methods used in Study 3, paying particular attention to those developed by the author.

7.3.4.1 CULTURAL PROBES

The Cultural Probes, originally developed by Bill Gaver, were adopted in the preparation stage with the aim to prepare the participants for the actual creative workshop and to introduce them to creative methods that were later on used at the workshop.

All involved participants had to reflect on how they were using different types of technology with a focus on computer use. In the Workbook with instructions they answered general questions related to their practice using computers, which was not very interesting for them. On other hand, all participants enjoyed creating Mind maps considerably more, apart from one older participant who rather described his relationship with computer (for the results see Appendix 12.6). The older people especially enjoyed taking photos with the disposable camera. Some participants liked filling the diary, as they were able to realise how much or not much they were using a computer. Unfortunately, there is no evidence that, in reality, the Cultural Probes prepared the participants for the creative workshops.

7.3.4.2 CREATIVE CARDS

The visual and verbal parts of the Cards helped to stimulate the participants' creativity in the incubation stage. The cards also functioned well when the participants clustered them in groups or wrote their ideas on them (see Figure 79). Cards were important in producing ideas as well as with voting to select the ones with most potential to be developed in more detail in the illumination stage.

The designers' groups used the smallest number of Creative cards in comparison to mixed groups and older people's groups. For example, the mixed yellow group used all available cards (see Appendix 13.1 and 13.2).

Cards were also sometimes used during the illumination stage of the workshop. For example, the designers' red group went back to the whiteboard while they were discussing the development of their design, to refresh their mind on ideas they came up with.

The use of Creative cards in the older people's groups was interrupted, as the members were disagreeing a lot (especially in the older people's red group) while they were developing new ideas and they often worked as individuals rather than a group (see Appendix 13.3). However, one older person from the older people's yellow group used the creative cards to demonstrate the size of the device that the group was designing.



Figure 79: Two examples of use of the Creative Cards: participants grouped several creative cards to present their idea.

7.3.4.3 WORKSHEETS: "TELL ME" AND "DRAW IT"

This approach used questions to help participants to make their ideas more tangible. With three sets of worksheets, participants had the opportunity to divide work inside the group and each member could work at their own speed, which happened in designers' and mixed groups. Normally groups divided work among members: someone draw sketches, another person answered questions and the third person built the model. Only the designers' red group and the older people's red group decided on one member who filled all the worksheets; these groups used the worksheets significantly as a set of guidelines during the entire session.

None of the groups specifically required the assistant to record their design process, as was suggested in the "Tell me" worksheets. However, all groups used the "Draw it" sheet and did some sketches. Especially productive was the mixed red group which produced several sketches (see Figure 73).

Both older peoples' groups needed some assistance with answering questions on the worksheets and understanding how to draw the storyboard. Only the older people's yellow group was not able to complete the worksheets on their own; therefore, the facilitator was required to help this group.

7.3.4.4 'MAGIC BOX' ("MAKE IT" WORKSHEET)

The 'Magic box', which was part of the "Make it" method, had an element of surprise to it for all groups, when the participants opened the box. The participants were very enthusiastic, for example an older person from the mixed yellow group built a tower from the materials twice, before the group even started to build the model. The participants enjoyed exploring the contents of the box and making the model, and in most groups all participants were involved in the building of the model. Sometimes during the discussion participants used certain pieces of material to illustrate the dimensions of the device that they were designing. For example, a designer from the designers' yellow group used cardboard to present the dimensions of the device.

The older people's red group spent most of the time building a model; this action united the entire group, as there was a certain amount of disagreement among the group members. Although the male member of this group, at the beginning, was not convinced of the sense of this activity, during the building process he changed his mind and at the end became fully engaged. For the designers' red and the mixed yellow group, building a model was not that important as they spent only the last 10 minutes making a model, they preferred to use worksheets and to discuss.

7.4 SUMMARY

7.4.1 BACKGROUND INFORMATION: RESEARCH AIMS

This study aimed to answer the third research question: *"Can older people be involved as equal partners in a creative UCD process for developing digital devices?"* Furthermore, the study attempted to respond to the following two objectives: i.) examine the nature of the creative process and ii.) measure novelty and appropriateness in the final creative output designed by different sets of people. Alongside was the intention to prove or disprove the following hypothesis: *"A creative user-centred design process conducted with mixed groups (older people and designers) is more appropriate for designing better products for older people than conducting the same process with either designers or older people alone."*

7.4.2 STATEMENTS OF RESULTS

a.) The creative process

The highest amount of topics, as well as number of turns in total, was observed in the mixed groups. The mixed groups made greater use of *viewing different options*, as well as *conflicts (positive disagreement)*, which may have contributed to the high number of *complex ideas*. In contrast, the designers' and the older people's groups had a very low number of positive *conflicts* among members. Participants in the mixed groups had more opportunity to draw inspiration from *life experiences* and *technology* than the participants in the groups with the same background. Finally, the total number of stimuli in the mixed groups was significantly higher than in the other four groups, which might be a result of their heterogeneity.

b.) The creative output

Despite the fact that only two experts completed the survey, there was some suggestion that the older people's groups developed less novel ideas compared to the designers' and mixed groups. However, the mixed groups may have designed more appropriate products for the older population in comparison to the other four groups.

c.) Group performance

The designers divided up tasks between themselves during the creative process and worked rather as individuals. The older people also preferred to work as individuals as they had difficulties in finding common agreement. On other hand, both mixed groups established energetic and lively discussion.

d.) Effectiveness of methods used

In general, all the methods adopted during the creative process worked well. All six groups were able to build models and answered the questions on the worksheets. Only the older people's yellow group required some assistance from the facilitator.

7.4.3 LIMITATIONS AND THREATS TO VALIDITY

a.) The creative process

It is necessary to report that the main study was conducted with a small number (18) of participants, and only 9 older participants - those in the small sample from Hackney.

Apart from comments on the final prototypes, both experts had some additional thoughts on the study. They considered recorded conversations during the design process as more important to analyse than the actual output of the design process. They also commented on the poor quality of the video data, especially for the designers' yellow group, where the participant who presented the prototype had a very soft voice. In addition, the experts were confused as there was not enough data given about the older people's yellow group, which designed a GPS navigation system (similar to a Tom Tom³⁷); instead of the actual device, the group built a model of a car with a driver and only indicated where in the car the device would be positioned (see Figure 65, photo 1 and 2).

b.) The creative output

Only a small number of experts were able to contribute to this study. Although eight experts were invited, only two professionals completed the entire study. Furthermore, the two experts had different backgrounds and they each evaluated the prototypes from their own perspective.

Comments on the findings from Study 3, the answer to the third research question and acceptance or rejection of the hypothesis will be discussed in the final chapter below.

³⁷ Tom Tom is a portable GPS car navigation system that can be used in a car, on a bicycle or on a mobile phone.

8 DISCUSSION AND CONCLUSIONS

This chapter summarises the thesis, addresses the research questions and hypothesis, and delivers the contributions of the research.

8.1 THESIS SUMMARY

This dissertation has involved older people and designers in the creative UCD process to design a better product for older people, in comparison to older people and designers working alone.

In the introductory chapter the thesis rationale was discussed and the outline of the PhD structure was presented, followed by the research questions, the hypothesis and the methods section. After that, the contributions to the field were discussed, and notes on terminology, ethics, publications and presentations were given. In the literature review only the relevant theory on creativity, designing technology for older people, and involving older people in the creative design process was presented. The four studies were then presented, answering the three research questions and the hypothesis.

8.1.1 STUDY 1: EVALUATION OF THE VIRTUAL GARDEN

The first preliminary study evaluated the acceptance of the future interactive device by older people and postgraduate students, and its appropriateness. The device was designed for older people in a common design process, adopting standard research methods including unstructured interviews, personas and brainstorming. The mock-up model was evaluated by three different sets of people: the very old people from the Vintage Club, the active older employees from Guy Chester House and the postgraduate students from the Chester House Halls of Residence. Three aspects of the prototype were investigated using semi-structured interviews: i.) the users' familiarization with the model; ii.) the users' opinion (criticism) of the mock-up model; and iii.) its adoption in three real-life situations. The results indicated a low acceptance of the mock-up model among the older population, as a consequence of the inadequate involvement of older people in the design process. These findings lead to the establishment two research questions with several objectives and a hypothesis.

8.1.2 STUDY 2: OBSERVING OLDER PEOPLE AND YOUNG DESIGNERS

The three field studies described in this chapter attempted to answer the first research question: *"What stimulates or inhibits creativity in older people in comparison with designers?"* The

observations also intended to provide information about: i.) older people and designers' experiences with technology; ii.) existing approaches and processes; iii.) factors which stimulate or inhibit creativity during the design process; and iv.) the practical implications for facilitating better creative engagement. Firstly, the creative engagement of the very old people at the Vintage Club in Muswell Hill was observed. Secondly, the education process of the active older people at the Hackney Silver Surfers Centre was studied. Finally, the design process of the postgraduate students at the Human Centred System program from the City University London was observed. Factors that stimulate and inhibit creativity were identified during the field studies, as well as any practical implications that would need to be considered in order to involve older people in creative engagement.

8.1.3 PILOT STUDY: TESTING THE PROPOSED CREATIVE DESIGN PROCESS

The aim of the pilot study was to test: i.) the proposed content of the creative design process and ii.) the procedure for analysing data in the main study. In order to address these aims the creative workshop was conducted with one researcher, one PhD student and one older person. Poincaré and Wallas's (1926) creative process was applied. Several methods were used to stimulate the participants' creativity, such the Cultural Probes method at the preparation stage, the creative cards at the incubation stage, and 'Tell me', 'Draw it' and 'Make it' at the illumination stage. The final outputs of the creative workshop were paper prototypes of the devices that will best satisfy older people's needs. The creative process and the creative output were analysed with the intention of discovering factors that stimulate and inhibit creativity. The final output evaluated the participants through questionnaires.

8.1.4 METHODOLOGY: APPLIED METHODS AND DATA ANALYSIS

This chapter aimed to present applied methods (Cultural Probes, creative workshop, Creative Cards, worksheets and the 'Magic Box') from other authors, adapted and reviewed the author's approach. After that, other researchers' approaches to measuring creativity and video analysis were presented, and finally lessons learned from the pilot study were reassessed. After that, the definitions of the parameters for measuring creativity were presented, including flexibility, flow and factors that stimulate and inhibit creativity. The approach for analysing creative output was given at the end.

8.1.5 STUDY 3: INVOLVING OLDER PEOPLE IN THE CREATIVE DESIGN OF DIGITAL DEVICES

This study had two major foci: to answer the second research question, and to prove or disprove the hypothesis. The second research question was *"can older people be involved as equal partners in a creative UCD process for developing digital devices?"* Three creative workshops were set up. The first

consisted of just designers, the second older people and designers, and the third of only older people. The participants in each group were divided into two smaller groups, each with three participants. Each workshop consisted of two parts: in the first part, the participants completed the Cultural Probes package that followed the interview. In the second part, the participants attended the workshop, which followed the four-stage creative process. Data was used to count topics, turns, and factors that stimulate and inhibit creativity through the creative process. Lastly, independent experts evaluated the final outputs of the creative workshops, the paper prototypes, by an on-line survey.

8.2 SUMMARISING THE FINDINGS, RESEARCH QUESTIONS AND HYPOTHESIS

8.2.1 MAIN FINDINGS

The main findings of this PhD study were the following:

Blocks and stimuli:

- F1 Older people and designers have different stimuli and blocks that limit them in their creative production (see RQ2).
- F2 When older people are working alone they develop the most blocks, and therefore are unable to fully develop their creative potential (see RQ2).
- F3 Mixed groups consisting of designers together with older people respond to more creative stimuli (see RQ2).

The creative process:

- F4 Older people are able to participate in a creative design process as equal partners; however, certain conditions have to be fulfilled for them to do so (see H and section 4.3.6).
- F5 Older people may perform better and have higher flexibility and flow when they are working together with designers (see H).

Creative output:

- F6 When older people and designers work together in a creative user centred design process they may design more appropriate products for the older population than designers or older people working alone (see H).

These findings are explained in more detail, and reflection on the research questions, hypothesis and thesis contribution are delivered below.

8.2.2 FIRST RESEARCH QUESTION

In relation to the first research question:

RQ 1 WHAT STIMULATES OR INHIBITS CREATIVITY IN OLDER PEOPLE IN COMPARISON WITH DESIGNERS?

the following findings were indicated:

8.2.2.1 STIMULI IN OLDER PEOPLE

In all studies different stimuli were identified; however, overall the most important were stimuli from applied methods (Creative Cards and from materials – ‘Magic box’), technology and life experiences. Two types of stimuli were indicated in very old people during the observations: something that could stir older people’s memories or life experiences (such as a poem, a song, a proverb or postcard) and some interesting content in event (for example a description of a pilgrimage, someone’s experiences in the RAF, and songs that marked someone’s life) (see section 4.2.4.5). In Study 3 (see section 7.3.1) the most effective were Creative Cards (used in the incubation stage) and stimuli from questions on worksheets and materials – ‘Magic box’. In the older people’s yellow group, stimuli from *technology* and *life experiences* were also effective.

8.2.2.2 STIMULI IN DESIGNERS

Technology and applied methods were the main two factors that stimulated creativity in designers in all the conducted studies. The use of materials in prototyping and working in a diverse group were two factors that stimulated designers in the design process in the observation study. Study 3 indicated stimuli from applied *methods* (stimuli from questions on worksheets, stimuli from materials – ‘Magic box’ and stimuli from the ‘Draw it’ method) and *technology*. In addition, *viewing different options* and *complex ideas* were identified as stimuli in Study 3. Finally, a low number of ideas was stimulated by the *life experiences* of this group (see section 7.3.1).

8.2.2.3 BLOCKS IN OLDER PEOPLE

The highest number of blocks was identified in this group. Slower task accomplishment, not being familiar with the terminology and age-related health conditions were identified as blocks in the group of active older people in observations (see section 4.3.3.3). The very old people had even more health problems, such as mobility difficulties, visual and hearing impairment and lack of concentration, all related to the progressive ageing process (see section 4.2.3.3).

In study 3, the biggest blocks were ***conflict, confusion and off topic conversation***. The facilitator and assistant were unfortunately also blocks to creativity on some cases. When the older people were working together in their equal groups they developed a high number of *conflicts*. This can be illustrated by their low tolerance in accepting one another's ideas and opinions; one of the participants said: *"We are like three individuals and it is hard for us work as a group."* *Confusion* was related to not understanding instructions, what was required from them, and the use of inappropriate terminology. The lack of concentration resulted in more *off topic* discussion (for example, discussing what was on TV the previous evening) in both older people's groups (see Appendix 16). The older people were easily distracted by the noise from the other groups, the assistant, who was taking photos, and the facilitator, who was providing additional information and explanation. In some cases, the older people started to talk to the facilitator, as they saw the facilitator as a friend rather than as a researcher.

8.2.2.4 BLOCKS IN DESIGNERS

A very low number of blocks were indicated in this group. The need for better time management, which would allow the designers to test their prototype with more disabled people, was the only block indicated in observations (see section 4.4.3.3). The *facilitator* was the only factor that inhibited creativity significantly in the designers in Study 3. However, when the designers worked together as a group there was more silence than in other groups (see section 7.3.3.1).

8.2.3 SECOND RESEARCH QUESTION

Reflection on the second research question:

RQ 2 CAN OLDER PEOPLE BE INVOLVED AS EQUAL PARTNERS IN A CREATIVE UCD PROCESS FOR DEVELOPING DIGITAL DEVICES?

The answer to this question is yes. The evidence shows that while older people make different contributions to designers in the design process their contributions are equally important when designing digital devices for the older population. While designers contribute knowledge of what is possible, older people contribute their life experiences and an understanding of what would be appropriate for the older population (see Chapters 5 and 7). In the mixed groups in Study 3, designers were challenged by the older people's views on what would be usable by other older people.

8.2.4 HYPOTHESIS

To evaluate the hypothesis below, certain differences between the workshops and the design output were considered.

H1 A CREATIVE USER CENTRED DESIGN PROCESS CONDUCTED WITH MIXED GROUPS (OLDER PEOPLE AND DESIGNERS) IS MORE APPROPRIATE FOR DESIGNING BETTER PRODUCTS FOR OLDER PEOPLE THAN CONDUCTING THE SAME PROCESS WITH EITHER DESIGNERS OR OLDER PEOPLE ALONE.

There is no evidence to disprove this hypothesis and some evidence to support it. The following differences that support the hypothesis were revealed during the creative design process, and by evaluating the creative output produced by mixed groups in comparison with designers and older people only.

8.2.4.1 MIXED GROUPS

a.) The creative process

- **More topics and a higher total number of turns were developed by mixed groups than by older people or designers working on their own**, which means that they had the highest flexibility of ideas (Guilford, 1959) and possibly also the greatest flow (Kerne et al., 2004).
- **Mixed groups had a significantly higher total number of stimuli**, as well as more varieties than the other four groups, older people in particular. Older people in the mixed groups had the opportunity to draw inspiration from *life experiences*, and the designers in these groups were able to draw on their experiences with *technology*, and this proved to be a useful combination.
- **In the mixed groups, a higher number of complex ideas and a significant number of *conflicts* (positive disagreement) among members were indicated.** An illustration of this situation would be when a designer suggested a feature of the device or how the device would interact with the user. If an older person disagreed with this suggestion, the designer had to accept this or suggest something new and better. This conflict might also cause a higher number of *complex ideas* in these groups.
- **Mixed groups experienced fewer blocks that inhibited creativity** than the older people's groups, and a similar number to the designers' groups (see section 7.3.1).

b.) Creative output

- Outputs produced by the mixed groups appeared to be of a similar novelty to those produced by the designers' groups, and perhaps more novel than those produced by the older people's groups.
- There were no obvious differences in the appropriateness of outputs produced by the mixed groups in comparison with those produced by the designers' or older people's groups.

8.2.4.2 DESIGNERS' AND OLDER PEOPLE'S GROUPS

a.) The creative process

- **A lower number of topics and turns** were identified for the designers' and older people's groups than for the mixed groups, which means that both the designers' groups and the older people's groups had a lower flexibility of ideas.
- **Designers' groups and older people's groups had a lower total number of stimuli**; none of these groups had any *positive disagreement* among members, and none showed many examples of developing *complex ideas*. Use of *life experiences* was also low for all of these groups in comparison with mixed groups.
- **In the older people's groups, there was no positive disagreement among members, and the lowest number of complex ideas and viewing different options** in comparison with the designers' and the mixed groups.
- While designers' groups experienced a similar number of blocks that inhibited creativity to the mixed groups, **older people's groups experienced many more blocks**. In particular, older people had problems with understanding instructions. There was a lot of negative conflict among the participants in older people's groups, and discussing issues not relevant to the creative process. In addition, older people had the highest amount of confusion and they were the most distracted by the assistant (see section 7.3.1).

b.) Creative output

- Outputs produced by the older people's groups were perhaps less novel than those produced by the designers' or mixed groups and the experts believed that these kinds of products already existed on the market
- As stated above, there were no obvious differences in the appropriateness of outputs produced by the designers' or older people's groups in comparison with the mixed groups.

8.3 THESIS CONTRIBUTION

This thesis brings forward the following contributions:

- Firstly, **new factors** that stimulate and inhibit creativity in older people were identified.
- Secondly, **a comparative study was done**, which brought together designers and older people in the creative design process demonstrating the feasibility and possibly the desirability of developing products for older people in this way. At the time of writing this thesis no other studies had been identified that put together older people and designers in this way.
- Thirdly, the study introduced two **new methods** for use in a creative user-centred design process designed by the author.
- Fourthly, the work identified **guidelines** that can be taken forward and applied in practice by developers.

More specifically, this thesis makes the following contributions.

8.3.1 FACTORS THAT STIMULATE CREATIVITY IN OLDER PEOPLE

The following new factors were indicated that stimulated creativity in older people in the conducted studies which were not found in the literature review (see section 7.3.1):

- **The 'Make it' method** with the 'Magic box', which contained prototyping materials; this method stimulated participants to make their model at the illumination stage of Study 3 (see section 7.3.1, table 27).

- The questions in the **worksheets** were useful for stimulating all groups, including older people.
- **Stimuli from technology** were useful for older people, especially when they were working in mixed groups with designers.
- **Life experiences** were a significant source of creative stimuli for older people, especially when they were working together with designers.

8.3.2 FACTORS THAT INHIBIT CREATIVITY IN OLDER PEOPLE

The following new factors that blocked creativity were identified, which were different from those presented by other authors, and which were entirely related to older people's groups:

- **Confusion** was the factor that inhibited creativity in older people the most. This confusion was usually related to not understanding instructions or what was required for them to do. Sometimes older people were distracted by noise from the other groups or other unpredictable disruptions in the environment.
- Conversations that were **off topic** were also a significant block to the creative process, especially for older people, perhaps due to lack of concentration and motivation.
- **Physical needs** (such as the toilet, refreshments) were factors that blocked older participants' creativity. From time to time (on occasion suddenly and without warning) older people left other members of the group at the table to go the toilet or to take something to eat/drink.

8.3.3 FEASIBILITY AND DESIRABILITY OF BRINGING DESIGNERS AND OLDER PEOPLE TOGETHER

The author identified no other comparable studies in the time of writing this thesis. The pilot study and Study 3 demonstrate that it is possible to conduct creative engagement where older people and designers can work together in the creative design process.

It may be a good idea to conduct a creative design process where designers and older people work together because this study provides some evidence to suggest that they may achieve greater

flexibility and flow, use more stimuli, and experience fewer blocks than designers or older people working alone. There is also weak evidence to suggest that outputs produced by designers and older people working together may be more novel than those produced by older people working alone.

8.3.4 NEW METHODS WERE INTRODUCED

The following new creative methods were introduced:

- The first new applied method was **the Creative Cards** at the incubation stage created by the author. They were applied with the aim of visually and verbally stimulating participants' creativity at the brainstorming session (see section 6.2.2.2). The cards helped participants to explore different options when they needed to answer questions related to the design of the new device. The participants used those cards in different ways: for presenting their ideas to other group members, for discussion, adding their own ideas, and grouping them when they wanted to present more complex ideas. These cards possibly stimulated ideas and made connections that would not have happened otherwise.
- The second new method was the **"Tell me", "Draw it" and "Make it"** group of approaches developed by the author and implemented using **worksheets** in the illumination stage (see section 6.2.2.2). These three approaches gave the participants the opportunity to express their ideas in three different ways: verbally, visually (with drawings and sketches) or materially (by building a paper prototype). All groups applied a mixture of approaches; although *"Make it"* with the different materials in the *"Magic Box"* was the method that stimulated creativity the most. None of the group specifically asked for assistant to record their design process, what was the possibility with *"Tell me"* approach.

8.3.5 GUIDELINES THAT CAN BE TAKEN FORWARD AND APPLIED IN PRACTICE BY DEVELOPERS

The following guidelines were established:

- **Firstly, it is necessary to understand older people as human beings.** Developers have to first understand who older people are, their lifestyles, their habits and how they identify and relate to the world, society, their peers and their families. To achieve this, it is necessary to spend some time with them.
- **It is important to involve older people at the beginning of the creative process.** At the moment they are involved at the end of the creative process, in usability testing of web sites, mobile phones, and remote controls. Lenfestey (2007, cited in Bushell, 2007: 9) states

that if users are brought in at the start of the user centred design process, the modifications can be low-cost, simple to do and can have more effect; however, when the process is at the end the changes are more time-consuming and expensive. In addition, designers can get feedback from older people immediately on design, forms, and interaction with the product.

- **Active older people are more appropriate for involvement in the creative process.** If it is the aim to design devices for the older population, we have to involve older people that use various types of technology in their daily routine, are willing to participate in group activities and whose health condition is reasonably good.
- **A concise and uncomplicated creative process has to be applied with older people.** It is essential to apply a concise creative process where results can be achieved in a short period of time, and for the participants to enjoy themselves during the creative engagement. For example, Cropley 's (2001) (see Table 2, section 2.2.2.3) creative process consists of seven stages and it is too demanding for older people; therefore it is necessary to apply a shorter and more concise one, such as the Wallas/Poincaré process (Wallas, 1926), which has only four stages. Finally, the creative event has to be conducted in one day (because of psychological limitations) and it has to be a maximum of five hours in length, since older people become tired more easily.
- **More methods that stimulate older people's creativity have to be applied in the creative process, not only the traditional ones.** Currently, researchers more often employ traditional methods (interviews, focus groups, surveys, usability tests), and apart from the greatly popular Cultural Probes there are not many other methods that are employed. However, researchers have to apply appropriate methods that will stimulate older people's creativity in an appropriate way. Firstly, at the gathering data stage it is necessary to apply suitable methods that will make gathering data more pleasurable for older people. Secondly, methods have to be decided on that will stimulate older people's creativity, their ideas, life experiences, mental processes, and thoughts. Also, it is important to provide older people with the opportunity to express their ideas in a variety of ways: verbally, visually (with drawings and sketches) or materially (by building paper prototypes). To conclude, it is important to apply these methods at specific stages to achieve the maximum affect.

- **Older people have to be involved with various different age groups.** Older people perform better in a more stimulating environment, and when they are involved with people from other age groups, and with different backgrounds and experiences; they can then use a higher number of stimuli, and generate better and more complex ideas.
- **The following practical implications** have to be considered when involving older people in the creative process (see Table 29):

Practical implication	Description
Appropriate time for the creative workshop	The most appropriate time for performing creative workshops with older people is between 10 am and 2 pm.
Length of the activities	The length of the activities could be up to five hours, but not longer.
Accessible and comfortable environment	The participants need to feel comfortable in the environment where the creative workshop is held, and need to be assured that they will get help if required. The workshop needs to be held in a place easy to access.
Facilitator	The facilitator needs to be aware of the participants' needs, friendly and in charge of the situation.
Assistant	The creative workshop with older people required an additional assistant to help the less skilled older participants.
Size of the group	Smaller groups of up to four people are more appropriate for older people.
Short breaks	Short breaks of at least five minutes need to be provided every forty-five minutes to one hour.
Refreshments	The participants need to be served with refreshments and a light meal during the creative session.
Disruption	For conducting creative workshops with older people it is necessary to provide a quiet place.
Terminology	At the beginning of the creative process all specific terminology (for example device, digital, electronic) needs to be explained.
How to deliver content	All content needs to be delivered in different forms (in case of hearing and visual impairment): for example, in written and oral form. A full-sized screen for projection and loudspeakers could also be employed.
Precise and clear instructions	Task instructions, procedures and written material (e.g. worksheets) need to be simple and clear, and delivered both in verbal and written forms.
Reward	Participants need to be rewarded for their participation, for example with vouchers or money.

Table 29: The practical implications that have to be considered when older people get involved in the creative workshops.

- **Finally, the creative output has to be evaluated by external experts.** Long and demanding questionnaires that need to be filled in by older people are not the most appropriate way of

evaluating the final creative output; for this and other reasons it is better to engage experts from the field to do this work.

8.4 LIMITATIONS OF THE RESEARCH

The following areas need further work for clarification, because the results cannot be totally generalised:

- **The results of the observations** need to be treated with caution, since this study was performed with a small sample of people, with certain groups (older people in Hackney) and at particular places (a university, a day centre). Therefore, the factors that stimulated and inhibited creativity in the observed groups indicated cannot be generalized; the same factors will not necessarily be identified using other arrangements. Therefore, it will be necessary to observe more groups of older people and designers in different settings, processes, and environments.
- **The creative workshops**, in the main study, were conducted no more than once and with only six participants in each group. Also, a limited number of methods were applied (the Cultural Probes, the Creative Cards, “Tell me”, “Draw it”, “Make it”); therefore it is not certain that under different circumstances the results would be the same. Thus, it will be necessary to conduct more creative workshops and with different methods being adopted.
- **The identified topics (and turns) in the creative process** cannot be generalised, since data were interpreted by only one researcher (the author), and other researchers might interpret the video data differently. The same caution has to be applied to the identified stimuli and blocks.
- **The creative output** from Study 3 was evaluated only by the two professionals who completed the entire study. Furthermore, both experts had slightly different backgrounds and they evaluated the prototypes from their own perspectives. Therefore, it will be necessary to invite additional experts to evaluate the prototypes.

8.5 CONCLUSIONS AND FURTHER WORK

It is necessary to understand that this thesis mainly concerns a specific group (the study was only done with a small group of older people and designers) and uses specific methods. Further work has to be done in order to generalise these methods and types of analysis to other circumstances. However, the work presented in the thesis demonstrates that **older people can be involved as equal partners in the creative design of digital devices**, as long as certain conditions are fulfilled.

Older people's creative potential has to be utilized more. Older people are currently seen as a problem in demographic predictions and statistics, as subjects in research areas, as users in the HCI area, or as consumers in the area of economics and marketing. In the area of creativity, it is important to see them as equal partners with valuable experiences, and to utilize their creative potential with appropriate methods and a more creative approach to the creative design processes we use to engage them.

Involving older people in the creative process has to become regular practice, not only in the area of research, usability and accessibility companies, but also in market research, industry and design companies. Currently older people are involved in the user centred design process in the area of research and in some bigger companies (such as Nokia and Intel), but not in small ones. Therefore it is necessary to encourage companies to involve older people more in the development of appropriate products. This thesis provides a starting point for further exploration of how this can be achieved.

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