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**HERMES - Cognitive Care and Guidance for Active Aging**  
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## **D.8.2 Persuasive Ethics guide**

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## **Abstract**

This document provides an overview of literature about the ethics of persuasive technology including definitions of persuasive technology and its use in everyday computing systems and applications. Furthermore, based on this literature framework the persuasive aspects of the development process of the HERMES system will be addressed and discussed.

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## 1. Introduction

### 1.1 Background

The HERMES project will provide novel assistive technology for integrated cognitive care through intelligent and non-obtrusive systems and associated cognitive training games, with the aim of reducing age-related decline of the elderly cognitive capabilities. Due to the project's scope research related ethical guidelines will be addressed throughout all its areas, like health and prevention, security and safety, cognitive training and sharing, of research and development.

With respect to human rights, free and full consent, dignity, privacy, confidentiality of personal data this deliverable addresses ethical issues for the research and development of a *persuasive*, pervasive, and non-obtrusive system. Nevertheless the HERMES system includes persuasive aspects for its use in everyday life of elderly people in order to implement its core goals of facilitating episodic memory, performing cognitive games, activity reminding to assist the user's prospective memory in performing everyday tasks and to support independent living, supporting conversation on the grounds of interactive reminiscence based on the recordings of important moments in everyday life and supporting the user's mobility outside of the house.

Because the core goals of the HERMES system aim to provide a better quality of life and social inclusion to foster the targeted end users' independent and self-determined life-style, ethical approaches must encompass a forward-looking guide of ethical rules and issues in ICT applications and services to ensure the acceptance of end users, its usability, as well as its accessibility.

The deliverable is structured as follows:

Chapter 2 presents a state of the art including an overview of how attitude or behaviour change can be influenced through human computer interaction and system or design. Chapter 3 deals with the research area of computers as persuasive technology, outlining definitions of terms and concepts. In chapter 4 a selection of Websites will be presented to show the application of the everyday use of persuasive technology in World Wide Web environment. Chapter 5 offers an overview of the involvement of ethical conduct in modern scientific research, by highlighting a categorization of information systems ethics and the principles of persuasive technology design. Finally, chapter 6 comprises the application of gained knowledge based on the literature survey about persuasive technology on the shape of the HERMES system. Referring to Mason's (1986) model of the categorization of information systems ethics, this section will address each point and provide a description of how the issues can be solved within the HERMES system.

### 1.2 Scope of this Deliverable

In the present deliverable an overview of persuasive technology in ICT systems is presented with regards to HERMES system applications, based on:

- The state of the art which comprises an overview of persuasive system research with a specific focus on researching how attitude or behaviour change can be influenced through human computer interaction and system or design.

- The implementation of ethical guidelines and conduct for persuasive technologies in modern scientific research in general and for the HERMES system especially.

HERMES deals with ethical issues with respect to users on two levels, (i) the R&D process level which involves users in the development of technology, and (ii) the implementation level of the final HERMES system.

On the first level, potential users are invited to interact with the technology and are involved in trials in which we can test the functionality and acceptance for HERMES (sub) systems. In this respect, respecting privacy, informing participants and ensuring data integrity and anonymity are the most important elements to guarantee ethical soundness. This first level is covered in the deliverable “D.8.1 Data protection and disclosure plan” (April 2008). In addition, this ethical soundness is ensured through the ethical advisory board and will be further covered in Deliverable D.8.3, which provides an ethical guide and manual for the conduction of the scheduled field trials in the project.

On the second level, HERMES technology itself can be considered partly ‘sensitive’ with respect to ethics, as it is integrated (unobtrusively) in the user’s home and can store everyday behavior of the user. This is part of the design of the technology, as exactly this is what it is good at, but at the same time poses the risk of privacy intrusion. In addition, the system tries to convince the user that using the system’s cognitive training capabilities is good and will have a certain attitudinal and/or behavioral effect on the end user (“persuasive technology”). The subject of privacy is covered in the deliverable D.8.1 and taken into account in the fundamental design of the system. The second aspect, persuasive technology, is the topic of this deliverable D.8.2.

With its contribution to the ethical consideration of persuasive technology, this document provides the background for one of the ethical cornerstones of the HERMES project. It will be used to provide input to the design of the technology architecture and specifically provides inputs for the interface and interaction design of the interfaces of the system and its cognitive training games.

## 2. Persuasion and Persuasive Systems

Psychology literature suggests many definitions of the term ‘persuasion’ (Reardon, 1991; Zimbardo et al, 1991). In this deliverable the term will be defined through the attempt to shape, change behaviours, feelings or thoughts about an issue. According to a definition of Fogg (1998) a true persuasion implies intent to change attitudes or behaviours.

Persuasive systems can be defined as systems that attempt to change attitudes or behaviour (or both) of people. In persuasive system research the focus is on researching how attitude or behaviour change can be influenced through human computer interaction and system or design. There are many other disciplines also dealing with attitude or behaviour change such as marketers or clinical psychologists, but when using the term persuasive systems this typically refers to human computer interaction systems as described above.

The accentuation of the topic persuasive systems and technologies happened in 2006<sup>1</sup> when the first conference ‘persuasion’, explicitly dedicated to persuasive technology, was organized and held yearly since then. The key topics of these conferences were the realms of health, comfort, and wellbeing, sustainability, education and training, communication, and of course the ethics of persuasive technology. Also theories of persuasion and related topics such as motivation, credibility, trust and control were of importance.

Summarizing the areas of application of persuasive systems two directions can be identified: on the one hand commerce and on the other hand support. One example for the application of persuasive systems in the area of commerce is eCommerce websites. Such websites often try to persuade users to buy certain products. Typical application domains of persuasive technologies are spread from general everyday eCommerce systems to highly specialized applications. In eCommerce the most common application are websites that use persuasive technologies to persuade the user to purchase products (e.g. through the use of recommender systems), provide information about themselves (e.g. when signing up for a service), or simply to spend more time on the site (to increase marketing possibilities).

The HERMES system follows the second approach described above which is characterized by the development of systems and devices, dedicated and specialized to support the user in reaching his goals. An additional aspect of this direction is the realm of research and development to support healthcare and sustainability.

Persuasive systems should be differentiated from systems that use coercion or deception to change the user’s behaviour. Such systems are typically not considered as persuasive systems. Systems which raise serious ethical issues through coercing or deceiving the user stand opposite to persuasive technology systems, which try to help people reaching goals set by themselves rather than manipulate them.

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<sup>1</sup> Conference Overview: <http://www.informatik.uni-trier.de/~ley/db/conf/persuasive/index.html>

### 3. Computers as Persuasive Technology

The term “captology”, standing for "computers as persuasive technology", was coined in 1993 at Stanford University (USA/CA) where the study of persuasive technology had begun. In 1997 the study of computers as persuasive technologies was introduced at CHI97 as a new area of inquiry. The researchers of this realm create a body of expertise in the design, theory, and analysis of persuasive technologies. B.J. Fogg was one of the first researchers who systematically looked into persuasive systems and can now be named as one of the leaders in this research area.

According to Fogg (2003, p. 20) there are five key terms and concepts for persuasive technologies:

- Persuasion is defined as an attempt to change attitudes or behaviours or both (without using coercion or deception).
- It focuses on attitude or behaviour change resulting from human computer-interaction (HCI), not from computer-mediated communication (CMC)
- It focuses on planned persuasive effects of technology, not on side effects of technology use.
- It focuses on endogenous, or "built-in", persuasive intent of interactive technology, not on exogenous persuasive intent (i.e., intent from the user or another outside source).
- It recognizes that technology can persuade on two levels, macro and micro.

In his book ‘Persuasive Technology’ Fogg (2003) identifies and describes seven types of persuasive technology tools. With this term he refers to interactive products that are designed to change attitudes or behaviours or both by making desired outcomes easier to achieve. The seven types of persuasive technology tools are:

1. reduction
2. tunnelling
3. tailoring
4. suggestion
5. self-monitoring
6. surveillance
7. conditioning

#### 3.1 *Mobile Persuasion*

Currently the focus of the research team of the captology lab lays on the mobile persuasion topic. The research realm of mobile persuasion consists of two main approaches: specialized mobile devices and applications that run on mobile platforms. On the one hand mobile persuasion involves the research on the changing use of the mobile phone in future; and on the other hand it involves persuasive technologies which are used for health care applications.

The yearly conference on mobile human computer interaction (MobileHCI) addresses topics related to the influence of persuasive system on human behaviour quite frequently. This year the conference includes research topics in the realm of mobile persuasion referring to the use of mobile devices to support and assist personal health care.

### 3.1.1 Macrosuasion and Microsuasion

The following section shows examples of persuasion in everyday life realms. Fogg created a distinction between ‘Macrosuasion’ and ‘Microsuasion’, which describes two different types of persuasion via computing technology. The term ‘Macrosuasion’ describes an entire product to be designed for a persuasive purpose, and on the other hand ‘Microsuasion’ describes the elements of influence in products that do not have an overall intent to persuade.

Several examples are displayed at <http://captology.stanford.edu/>.

#### Macrosuasion:

**Persuasive Software** - Quitnet.com - A website that motivates people to quit smoking



**Persuasive Device** - Baby Think It Over - Teen pregnancy prevention doll



**Persuasive Environment** - HygieneGuard - Bathroom surveillance technology





**Microsuasion:**

**Ebay feedback system** - Ebay uses a rating system to motivate people to be fair and honest while buying and selling. A coloured star and a number are placed next to the users' names to indicate different levels of feedback.

**Nagscreens in shareware** - People who create shareware like to get paid for their work. Some developers have created “nagscreens” — a dialogue box that reminds people to pay.



**Dialogue box in Quicken** - Even though Quicken is a personal finance application, it uses various elements of persuasion. For example, to reward people for balancing their accounts, the software brings up a dialogue box that congratulates them with balloons and streamers.

## 4. 'Everyday Life' Examples of Persuasion:

As described before persuasive systems are defined as systems that attempt to change attitudes or behaviour (or both) of people. This chapter is due to show and highlight some 'everyday life' examples of the use and calling attention to persuasion on sites on the World Wide Web.

### **Smokers may find redemption on mobiles**

(Source: <http://www.textually.org/textually/archives/2007/10/017605.htm>)



For millions of smokers itching to quit, new Web-based technologies are promising to stand by you like a close friend through those dark days of stress and withdrawal. "Internet sites and discussion forums dedicated to kicking the nicotine habit have been around for more than a decade. Now they are following smokers to their cell phones, social networks and anywhere else to remind them that it's not worth lighting up. Colorado's STEPP and Denver-based ad agency Cactus developed a message system on cell phones with an Internet quit program. Initially aimed at high school students in Colorado, the state hopes to soon share its fledgling FixNixer program as a technique for all age groups and geographies. QuitNet.com, one of the most

established Web sites for quitting, is also considering more tailored messages to users of its site and a foray into mobile, while quit support groups are popping up on social networks 'My Space' and 'Facebook'.

### **Using Eye-tracking to Optimise Persuasion-Centered Design**

(Source: <http://www.usabilitynews.com/news/article3855.asp>)

Persuasion-Centered Design (PCD) utilises behavioural segmentation to plan different user journeys for different personality types. For example, competitive consumers receive less detailed information than methodical consumers. PCD facilitates consumers in self-selecting their behavioural type by utilizing descriptive in line links. By eyetracking consumers we can see if they engage with a link and choose not to select it. With PCD this outcome is often a planned for event, one that would be impossible to reliably measure without eyetracking.

### **A mobile network that keeps track of everything you do**

(Source: <http://www.asiamedia.ucla.edu/article.asp?parentid=49788>)

Telecom operator KDDI Corp to introduce Lifelog Pod, a network that allows people to view others' online activity. For those who relish looking back on the small, often inconsequential details of their lives, a Japanese company has come up with a "Big Brother" mobile network that makes up where human memory fails. Japan's No. 2 telecom operator KDDI Corp said

yesterday that it had developed a server which keeps an electronic record of the smallest events in a person's life and lets others sift through them. The Lifelog Pod jots down every activity made through a cellphone or computer, including taking photographs, searching for a restaurant, listening to music and managing money. While some may loathe the thought of an omniscient network, the company said it could provide a way to make friends. "Users can learn who else their friends chat with or delve through their companions" data -- minus areas protected by passwords -- to gauge their interests," a KDDI spokesman said. "Your information is connected to that of your friend, and that of his friend, and so on." In this country of cellphone aficionados, cellphone users can also put their blogs on the common server. Only people who have a common connection -- such as a mutual friend -- will be able to access each other's data. "This isn't a violation of privacy rights," the KDDI official said. "It is simply that everyone is connected."

### **How Internet Addiction Is Affecting Lives**

(Source: ScienceDaily May 2006

<http://www.sciencedaily.com/releases/2006/05/060510091101.htm>)

The Internet -- millions of people rely on it for everyday tasks. But when is the line crossed between average use and addiction? An article published in Perspectives in Psychiatric Care states, "The Internet has properties that for some individuals promote addictive behaviours and pseudo-intimate interpersonal relationships." Nurse practitioners will soon find themselves faced with the issues of "internet addicts" and their inability to get offline.

While not yet defined as a true addiction, many are suffering the consequences of obsession with the online world, unable to control their use. From gaming to sexual and emotional relationships, the internet is taking over lives. More and more people will be confronted with consequences such as divorce and physical symptoms which will force them to seek both medical and psychological treatment.

## 5. Ethical conduct in modern scientific research

The involvement of ethical conduct in modern scientific research can be described as its cornerstone and main characteristic. Because scientific research often consults human subjects directly and/ or indirectly in its inquiries, it is of implicit necessity to pay special attention to this kind of scientific research.

The seventh framework programme of the European Commission addressed especially the topic of how to introduce the ethical perspective into the working structure of a research consortium, by defining three major directions of ethics in scientific and industrial research.

Ethics is:

- An academic discipline. Ethics is the critical study of the norms that guide our actions.
- Practical skills. Ethics is the practical art of knowing how to apply moral principles in concrete situations.
- Value systems. Ethics deals with the core values that guide a person or an organisation on the way to its shared vision.

The European Commission defines the principles of European research ethics through following points<sup>2</sup>:

- The principle of respect for human dignity
- The principle of utility
- The principle of precaution
- The principle of justice

Furthermore the International Center for Information Ethics (ICIE)<sup>3</sup>, created by Rafael Capurro in 1999, provides a vivid overview<sup>4</sup> about the ongoing academic research activities on information ethics<sup>5</sup>.

Leading computer sciences professional organizations like the Association for Computing Machinery (ACM) and the IEEE Computer Society have published codes of ethics and professional conduct but nevertheless these codes are much more use for professionals than for researcher scientists. Concluding it can be observed that existing codes of research ethics do not succinctly fulfil the need for ethical guidelines for ethical scientific research in the computer sciences.

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<sup>2</sup> further information on:

<http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=366&lang=1>

<sup>3</sup> Source: <http://icie.zkm.de/>

<sup>4</sup> The **IRIE**, the official journal of the ICIE which envisions an international as well as intercultural discussion focusing on the ethical impacts of information technology on human practices and thinking, social interaction, other areas of science and research and the society itself. Source: <http://www.i-r-i-e.net/>.

<sup>5</sup> Research Ethics: <http://www.ethicsweb.ca/resources/research/index.html>

Illinois Institute of Technology – Code of ethics online: <http://ethics.iit.edu/codes/coe.html>

Information Resources for Information Professionals: <http://web.syr.edu/~jryan/infopro/ethics.html>

The ethics of persuasive technology are characterized by its diversity and wide range of applications. The following overview demonstrates a framework for the body of research involved and aims to provide a roadmap for future research that illustrates the importance of maintaining a strong connection between persuasive technology ethics and all of the various perspectives from which persuasive technologies are viewed and studied.

Persuasive systems should be differentiated from systems that use coercion or deception to change the user's behaviour. Such systems are typically not considered as persuasive systems. Also such systems raise much more serious ethical issues than persuasive technologies, which often try to help people reaching goals set by themselves rather than manipulate them. 'Persuasion' in a Pervasive Technology context is defined to exclude coercion (Fogg, 2003, p.15), it is recognised that "the line between persuasion and coercion can be a fine one" (Fogg, 2003, p.21). Redström (2006) argues, that if all design is persuasive, then coercive design may simply be an 'unethical' subset, with its boundaries inevitably subject to analysis (Berdichevsky, 1999), debate and possible revision.

### ***5.1 Ethics of Information Systems – An Overview***

The diversity of places and ways in which people interact with technology continues to grow and develop at unexpected speed. Communications, entertainment and business are a few examples of the agencies being revolutionized at the astonishing pace with which information technology has been developed and with this the information driven society. The relationship between people and the technological systems, as well as products they come in contact with, create and use are constantly changing and rebuilding themselves. In using and creating such systems and technologies ethical concerns arise. Persuasive ethics research shall be involved with the studies of potential system abuses and malfunctions, as well as with the theories that surround them. To reach a stage of awareness in people's minds while creating, selling and using such technologies is the main focus of the ethics of persuasive technologies.

"Ethics is about human conduct, and the use and development of computer technology is part of human conduct."

Weckert and Adeney (1997, page ix)

### ***5.2 Categorization of Information Systems Ethics***

Mason (1986) provided the best known classification of the concerns that make up the information systems ethics field, by defining a model named: PAPA – Privacy, Accuracy, Property, and Accessibility. Altschuller (2004) cited his model by showing that all the vulnerabilities involved in the reliance upon intellectual capital in the information systems age can be summarized by those four categories.

**Privacy** The power that current and future information systems afford us with to gather information about people, their preferences, and their activities by way of surveillance, communication and, storage and retrieval is increasing (Mason, 1986).

**Accuracy** Systems that collect information about people can portray a very wrong profile of somebody if information is inaccurate. For information that is used by systems that make financial decisions, weather pattern predictions, aircraft flight decisions, medical assessments, or wartime combat judgements in accuracies could potentially have devastating effects.

**Property** Soft-lifting, copying of digital art forms, and the ease with which users can now transfer electronic content are all subject for study in this area of information system ethics (examples: Phukan & Dhillon, 2000; Glass, 1996; Grosso, 2000).

**Accessibility** Mason (1986) describes the potential social problems in which progress is limited only to those who have the education, resources, and money to access the information they need.

Smith (2002) criticizes Mason's framework insofar as it only seems to be quite inclusive but the scope is still limited as there are a number of issues that have been discussed that don't fit into this classification.

### ***5.3 The ethics of persuasive technology***

This research realm still seems to be a rather unattended research field. Persuasion can be observed in diverse ways these days and because of this, developers and users should be aware of relevant ethical issues concerning this point. Human beings can persuade for example through flattery, conditioning, through rewarding and punishing desirable and undesirable behaviours. The methods employed by persuasive technology are similar to those employed by persuasive people. Regarding to the fact that recently developed technologies are designed to actively persuade the user to change her or his attitudes and behaviours, ethical issues have to be considered from users and developers perspective. Fogg (1997) pointed out that computers can flatter too, by embedding these methods of persuasion and seduction in a new and compelling context. In 1999 Berdichevsky and Neuenschwander established a first set of principled guidelines for the design and implementation of persuasive technologies.

### ***5.4 The Principles of Ethical Persuasive Technology Design***

Berdichevsky and Neuenschwander (1999) provide a set of guidelines or 'rules' to distinguish the design of ethically sound persuasive technology from persuasive (or coercive) technology per se. Their focus is on the ethics of persuasion in general and translate these to ethics in relation to technology that persuade. There is a difference between a health consultant and a car salesperson in terms of what is persuasion, even when no technology is involved. Only if such distinction can be translated to technology, the persuasive technology can be deemed ethically sound or correct. These eight principles are listed below:

- 1) The intended outcome of any persuasive technology should never be one that would be deemed unethical if the persuasion were undertaken without the technology or if the outcome occurred independently of persuasion.
- 2) The motivations behind the creation of a persuasive technology should never be such that they would be deemed unethical if they led to more traditional persuasion.
- 3) The creators of a persuasive technology must consider, contend with, and assume responsibility for all reasonably predictable outcomes of its use.
- 4) The creators of a persuasive technology must ensure that it regards the privacy of users with at least as much respect as they regard their own privacy.
- 5) Persuasive technologies relaying personal information about a user to a third party must be closely scrutinized for privacy concerns.
- 6) The creators of a persuasive technology should disclose their motivations, methods, and intended outcomes, except when such disclosure would significantly undermine an otherwise ethical goal.
- 7) Persuasive technologies must not misinform in order to achieve their persuasive end.
- 8) The Golden Rule of Persuasion: The creators of a persuasive technology should never seek to persuade a person or persons of something they themselves would not consent to be persuaded to do.

Berdichevsky and Neuenschwander (1999) go on by stating that persuasion distributes responsibility between the persuader and the persuaded and agree to the ethicist Kenneth E. Anderson's (1971) definition that when one person is persuading the other, all parties share full moral accountability for the outcome. Following this argumentation the ACM Code of Ethics offers additional information on ethical principles (see <http://www.acm.org/about/code-of-ethics>).

According to Fogg (2003) more acute ethical issues arise while researching and evaluating on persuasive technology like for instance during studies on products designed solely for information, like Web-sites. He states that the changing of attitudes and behaviours of participants during a study must not always be positive. In his point of view it is essential as researcher or evaluator to be careful when setting up the research experience by accepting standards for recruiting, involving and debrief participants. An informed consent, which guarantees the participant in the study to be treated with respect, as well as it involves information about the nature of the study, the methods used and explains the possibility to withdraw from the study, as well as to offer the participant research institution details to be able to contact the researcher later on.

Furthermore he goes on with giving two examples on methods of persuasive technology to change attitudes and behaviours which are nearly always unethical: deception and coercion. He mentions web ads as outstanding example of computer-based deception. They offer things like the winning of money or they show false alarms of computer problems, in fact they promise



information which never gets delivered. The software installation of programs is mentioned as example of the unethical coercion, because during the installation process the installation of additional software is required which is a part of the overall product.

A challenging aspect – to enhance the research on the ethics of persuasive technology – would be to back Clement and Wagner’s (1996, p 234) invocation concerning the need for “... rich descriptions of actual conflicts and of how participants cope with them ...” up with data and examples in order to build and renew the important research work on ethics in computer related sciences.

## **6. Interviews with project participants and relevant stakeholders**

Up to this point we have developed an ethics guide to follow based on literature research. This guide is described in the following sections of this document. By doing so we are following general ethical principles that have been developed for the creation of persuasive technologies. In order to be HERMES specific we have drawn requirements for our own work from these.

We are currently also developing a questionnaire for the interviews with project partners and stakeholders. In this questionnaire we will focus on:

What do technical project partners do to implement the requirements into the system?  
Do all the project partners agree with the system we together as a consortium are building – seen from an ethical standpoint?

This ethical review is currently being developed and is scheduled for month 13 of the project. In this one year timeframe, all project partners and people involved will have had enough time to get acquainted with all the various (ethical and technological) aspects that the project brings with it. Performing these interviews exactly one year after the project’s kick off makes it possible for a first reflection on the past year and an outlook on the coming two years.

We will perform interviews with project participants and relevant stakeholders regarding ethics and also in particular with respect to ethics of persuasive technology. As shown in the previous chapters, ethical valence strongly depends on the motivations of the creators. Specifically the following people will be consulted:

- the project partners
- ethical advisors
- relevant stakeholders



## 7. Persuasive Technology within the HERMES Project

This section of the document describes how we can shape the persuasive aspects of the HERMES system best to follow ethical principals and to create positive values.

The HERMES system is comprised of a home-based computer with audio and video sensors, as well as a mobile phone/PDA. The system will comprise a number of elements to support people who face age-related decline of cognitive capabilities and assisting them where necessary, as described in the deliverable D.2.3. These can be divided in three main domains:

- Past – support episodic memory
- Future – support prospective memory
- Cognitive Training – improve/train cognitive capacities

The Past functionality shall provide possibilities for the older adult to browse and search events that lie in the past in order to refresh one's memory and re-experience the past. HERMES Future shall support users in planning their future, be it storing appointments, composing a shopping list or planning the next visit with a doctor. The third application provides an opportunity for the user to train him/herself regarding cognitive abilities.

In the requirement analysis that is described in detail in D 2.1 one finding was that older adults do not feel the need for more information in order to lead a healthy lifestyle. Older adults are convinced that what they need is the right attitude. This finding is a crucial point for the HERMES project because we strive to build a piece of technology that supports older adults in staying healthy and leading an active lifestyle for as long as possible, since the HERMES user-group refuse to depend on technology. Another finding of the requirements analysis showed that the technology shall play the role of a friendly supporter. The HERMES system should meet users' needs through offering support in either maintaining or helping to develop the right attitude.

It is important that we do not build a system that crosses the line towards coercion and/or deception. The question now is: How do we build a HERMES system that persuades users in an ethically sound way?

Based on the literature survey in former sections, we can extract different strategies to build a persuasive system. These principles and guidelines will be used firstly to build a system which will afterwards be evaluated and optimized.

The also above described PAPA model created by Mason (1986) in combination with the principles of persuasive technology design by Berdichevsky and Neuenschwander (1999) provide a framework of ethical guidance in which the process of designing the system can be set.

## 7.1 *Building Persuasion into an Ethical System*

Diverse ethical concerns and issues are addressed within this project. In the beginning of this section we will explain technologies and strategies to build a persuasive system and go on with the process to address ethical issues which arise through the act of building such a system that is chosen in the HERMES project.

### 7.1.1 The persuasive system

The HERMES system offers a way to exercise one's brain. In this context the computer is a tool that enables its user to perform these exercises. A technological tool can be persuasive in three different ways (Fogg, 2003):

- It can make the target behavior easier to do
- It can support the user in leading people through a process
- It can perform calculations and measurements that motivate

The HERMES system makes it easy to exercise one's cognitive abilities due to its ubiquitousness. Users can practice wherever they want and can define the level of difficulty of the game according to their needs.

The second strategy to build a persuasive system, according to Fogg, is to support the user in leading her/him through a process, step by step, which enhances the discussed strategy beforehand. Leading a user through a process can make a process easier and therefore more enjoyable for the user.

The third point says that a computer can perform calculations and measurements that motivate. When we build a system that provides possibilities for users to train themselves the scores one gets can be a highly motivating factor. HERMES will offer the user visual feedback from their progress, and will also remind him/her to play in the case he/she has not done it in a period of time.

For HERMES we will take care and provide different levels of complexity in order for the user to choose the right level in order to prevent the user from getting frustrated. Additionally a user might want to start with an easy level and has the chance to change to a more difficult level to keep the activation in the right level.

If a user can get into a state of flow while training her self, that greatly contributes to a positive user experience of the system. The psychological concept for Flow was developed by Mihály Csíkszentmihályi (1975). The concept itself is rather old, but still worth mentioning. Chen (2007) writes in the abstract of the paper "Flow in games (and everything else)" that a well designed game brings its players to the personal flow zones.

Flow describes a mental state in which a person is fully immersed in what she/he is actually doing and experiences a positive energy. Factors that accompany the experience of flow are:

- Clear goals (expectations and rules are discernible and goals are attainable and align appropriately with one's skill set and abilities).

- Concentrating and focusing, a high degree of concentration on a limited field of attention (a person engaged in the activity will have the opportunity to focus and to delve deeply into it).
- A loss of the feeling of self-consciousness, the merging of action and awareness.
- Distorted sense of time, one's subjective experience of time is altered.
- Direct and immediate feedback (successes and failures in the course of the activity are apparent, so that behavior can be adjusted as needed).
- Balance between ability level and challenge (the activity is neither too easy nor too difficult).
- A sense of personal control over the situation or activity.
- The activity is intrinsically rewarding, so there is an effortlessness of action.
- People become absorbed in their activity, and focus of awareness is narrowed down to the activity itself, action awareness merging

Not all of these factors need to be fulfilled to experience flow (Csíkszentmihályi, 1975). In HERMES we strive to develop cognitive games that can provide experiences of Flow to the users. Figure 1 shows the Flow concept, as described by Chen.

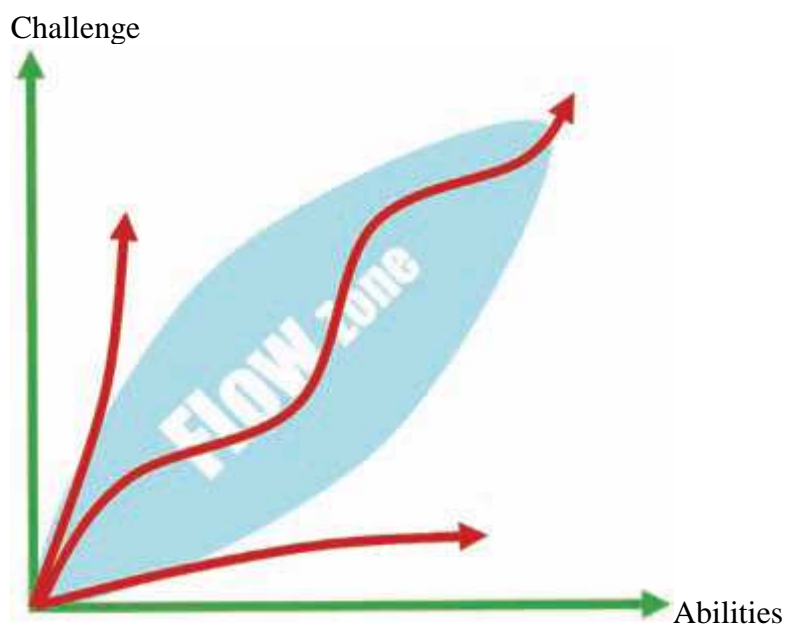


Figure 1: The Flow zone (Chen 2007)

Since HERMES is a computing system, new games can be developed and installed. This might help to keep the user interested and offers the possibility for a personalized training of one's cognitive abilities.

The ability to customize the HERMES system is important. The user requirements analysis showed that the HERMES user-group is composed of individuals who like to do things their way. HERMES users will appreciate a system that can be adapted to their needs. We expect that a tailored cognitive training game has a greater effect on the user than if she had to use just some training game that is available.

The possibility to perform cognitive training and the resulting probability for flow-like experiences will contribute to the overall motivation to use the HERMES system for cognitive training.

Earlier in this document we described technologies that enable us to build a persuasive system. At this point we would like to elaborate these and set them in relation to HERMES. These technologies are (Fogg, 2006):

1. Reduction
2. Tunnelling
3. Tailoring
4. Suggestion
5. Self-monitoring
6. Surveillance
7. Conditioning

Reduction technologies make target behaviours easier by reducing a complex activity to a few simple steps (or ideally, one single step). Reduction technologies aim to reduce the complexity of a task and therefore increase the probability of actually performing that task. A great amount of studies has been carried out in the field of psychology and cognitive science to support the theory that humans seek to minimize costs and maximize gains (Vroom, 1964). In this sense, one of the most important current theories in the field of successful ageing, that has marked the contemporary research in Psychology of Ageing, is that coined by Paul and Margaret Baltes in 1990 (Baltes and Baltes, 1990), and named: "Model of Selective Optimization with Compensation". According to this model, successful development encompasses the selection of functional domains on which to focus one's resources, optimizing developmental potential (maximization of gains) and compensating for losses, thereby, ensuring the maintenance of functioning (minimization of losses). This theory constitutes a general model of development defining universal processes of developmental regulation (Baltes et al, 2004).

A central concept of the second type – tunnelling - is to lead the user through a predefined sequence of actions or events, step by step. Guiding the user through a process or experience provides opportunities to persuade along the way. Within HERMES we might not use this technology since older adults feel like they already have enough knowledge to lead a healthy lifestyle and therefore contribute to a long and independent life.

Information provided by computing technology is more persuasive if it is tailored to the individual's needs, interests, personality, usage context, or other factors relevant to the individual. Tailoring technologies make life simpler for users who don't want to wade through

volumes of generic information to find what's relevant for them. Tailored information is more effective in changing attitudes and behaviour. We can think of using the right information to build interesting games for users, games with personal character.

The suggestion strategy is based on the concept of proposing behaviour at the most opportune moment.

Further, the tools of self-monitoring allow people to observe themselves to modify their attitudes or behaviour to achieve a predefined goal or outcome. This can be achieved by providing feedback to the user of actual scores in the game and also providing feedback during the whole process of use. This enables the user to monitor her or his progress in cognitive training.

Persuasion through observation describes people's different behaviour when realizing that they are being watched. This technology for building a persuasive system is not used within the HERMES project.

Reinforcing target behaviour refers to systems that use principles of operant conditioning to change behaviour. Within HERMES, the system can give positive feedback to the user when she is exercising her cognitive abilities in order to provide the user with positive reinforcement. The positive reinforcement increases the possibilities that one behaviour will be repeated in the future.

### **7.1.2 Interface design as a strategy for persuasion.**

The design of the interface can be seen as a strategy to build a persuasive technology. Because the interface is what the user ultimately will see, it needs to be attractive. Friendliness and visual attractiveness have a great influence on the perceived qualities of a system. A friendly and attractive user interface may invoke curiosity and therefore attract users to the system. This is an important point because the users of HERMES do not have much computer literacy and tend to avoid getting in contact with new technologies. A system that is easy to use and makes fun using it will greatly contribute to create openness among the HERMES user-group towards other modern technologies. Much more detail on interface-design can be found in D2.2.

Though, the myCognitiveTraining function might be the foremost area to work with persuasion, also the myPast and myFuture function can contribute to the aim of leading the user to an active lifestyle with the right attitude. An easy and friendly system will support the HERMES user in planning his or her activities and therefore contribute to the overall perception of life quality among the HERMES users.

### **7.1.3 Ethical Requirements for HERMES' Persuasive Elements**

As already mentioned we use the model developed by Mason and the principles of persuasive technology design by Berdichevsky and Neuenschwander (1999) as a guide for the steps taken in the project to ensure ethically sound persuasive technology design.

Mason (1986) names four cornerstones:

- Privacy
- Accuracy
- Property
- Accessibility

A system like HERMES, as it stores data from the life of its user and other persons has to incorporate security arrangements in order to keep the private data secure. Any unwanted distribution of personal data is not acceptable and therefore this issue gets as well addressed in the project.

As the HERMES user will use the system to browse her or his past, plan her or his future and train her or his mind the accuracy of the system and its output needs to be granted. An example would be when a user plays a cognitive game with data that comes from her or his life (e.g., future appointments). If the system provides wrong dates to the user many unforeseeable events can happen. Also the fact that the HERMES system will be used to store medical data about what medication a user is currently taking and so on, errors and wrong data can lead to fatal consequences.

Regarding the principles for the design of persuasive technology by Berdichevsky and Neuenschwander (1999) we have to monitor users as we progress and evaluate the findings of the project accordingly, as described below.

*1) The intended outcome of any persuasive technology should never be one that would be deemed unethical if the persuasion were undertaken without the technology or if the outcome occurred independently of persuasion.*

- Requirements for HERMES deduced from this principle
  - R. 1.1. The aim of HERMES' persuasive strategy for cognitive games must solely focus on increased uptake of cognitive games and adherence to training program.
- Process for ethical quality assurance with regards to this principle
  - To develop cognitive games theoretical understanding of neuropsychological processes such as cognition and emotion, and play is necessary. We do have this knowledge within our consortium.
  - The contents of the games must have a foundation on pedagogic, learning and cognitive psychology findings based-on-evidence, and a foundation on design research.
  - Basic rules that have to be followed are the following:
    - The cognitive games cannot include wrong information. No interference derived from the inclusion of wrong information should happen. If a user mixes the real information with wrong information arbitrarily introduced to increase level of difficulty, the purpose of the game can be disrupted.
    - If a dual task is presented, this must imply different cognitive processes.
    - Information about 2 appointments cannot be mixed in one item, because the user could get confused and involuntarily mix them in his/her memory.
    - Cognitive games should be based on Errorless Learning theories and adapt to each user's adequate cognitive level.

2) *The motivations behind the creation of a persuasive technology should never be such that they would be deemed unethical if they led to more traditional persuasion.*

- Requirements for HERMES deduced from this principle
  - R. 2.1. The motivation to engage older adults in leading an active lifestyle and as a result have them living independently for as long as possible is the main reason for the development of the HERMES system.
- Process for ethical quality assurance with regards to this principle
  - o We are ethically sound because the motivations that lie behind the creation and development of the HERMES system in our beliefs are noble. If our system leads to more traditional persuasion, the better.

3) *The creators of a persuasive technology must consider, contend with, and assume responsibility for all reasonably predictable outcomes of its use.*

- Requirements for HERMES deduced from this principle
  - R. 3.1. The intended outcome of the project is a system that supports older adults with age-related cognitive decline in leading an active life-style. This shall enable these older adults to live independently for as long as possible. We have to consider responsibility for the outcome of the project since we are producing persuasive technology.
- Process for ethical quality assurance with regards to this principle
  - o Since the persuasive element of the HERMES system is to support older adults in their own goals we are ready to accept the responsibility.

4) *The creators of a persuasive technology must ensure that it regards the privacy of users with at least as much respect as they regard their own privacy.*

- Requirements for HERMES deduced from this principle
  - R. 4.1. Much personal data will be collected by the HERMES system. We need to make sure that this personal data is well protected.
- Process for checking that we are ethically sound
  - We will use methods (login with password, data encryption) to secure that the data collected by the HERMES system is safe. The privacy of the user shall be guaranteed this way. For this, D8.1: “Data protection Plan” (April 08) has been written and approved by all member of HERMES consortium, taking into account all European and National laws regarding personal data protection.

5) *Persuasive technologies relaying personal information about a user to a third party must be closely scrutinized for privacy concerns.*

- Requirements for HERMES deduced from this principle
  - R. 5.1. No private data shall be given to a third party without the user



agreement to it.

- Process for ethical quality assurance with regards to this principle  
The system is constructed in a way that automatic data transfer to systems that do not belong directly to the actual user and are part of the original HERMES system will not happen.

*6) The creators of a persuasive technology should disclose their motivations, methods, and intended outcomes, except when such disclosure would significantly undermine an otherwise ethical goal.*

- Requirements for HERMES deduced from this principle  
R 6.1. The Consortium needs to be open regarding motivations, methods and intended outcomes.
- Process for ethical quality assurance with regards to this principle  
We are open about every step that is taken within the project. The intended outcomes of the project have been defined right from the start of the project.

*7) Persuasive technologies must not misinform in order to achieve their persuasive end.*

- Requirements for HERMES deduced from this principle  
R. 7.1. Data that is coming from the HERMES system needs to be correct. Personal data used for cognitive games (e.g., appointments) is not subject of any manipulation.
- Process for ethical quality assurance with regards to this principle  
Within HERMES we do follow this rule. We will not misinform any user in order to achieve any persuasive end. To guarantee this we do not manipulate personal data or any other kind of data used by the end user.

*8) The Golden Rule of Persuasion: The creators of a persuasive technology should never seek to persuade a person or persons of something they themselves would not consent to be persuaded to do.*

- Requirements for HERMES deduced from this principle  
R. 8.1. Examine if the golden rule is true for all people working on the project and stick to the rule.
- Process for ethical quality assurance with regards to this principle  
Anyone in the consortium - to his/her best beliefs - is sure to develop a useful and ethical system.



## 8. Conclusion and next steps

Through the implementation of these guidelines in the development process of HERMES, the system will be valuable and ethically correct persuading users to enhance their active cognitive training in order to prolong their independent and self-determined lifestyle.

In this document we focus on ethics in the context of persuasive technology. We do so because within the HERMES project we are developing persuasive components. Whenever persuasion is involved ethical issues have to be monitored carefully. To be able to fulfill this basic principle we have developed a persuasive ethics guide, based on literature research. Further interviews with project participants and relevant stakeholders are planned. These interviews should be carried out once the scope of the project is defined more precisely.

In section 7 of this document we have provided principles by Berdichevsky and Neuenschwander (1999). Also explained in section 7 is the way we plan to address the resulting requirements during the course of the project. To recapture these principles:

- 1) The intended outcome of any persuasive technology should never be one that would be deemed unethical if the persuasion were undertaken without the technology or if the outcome occurred independently of persuasion.
- 2) The motivations behind the creation of a persuasive technology should never be such that they would be deemed unethical if they led to more traditional persuasion.
- 3) The creators of a persuasive technology must consider, contend with, and assume responsibility for all reasonably predictable outcomes of its use.
- 4) The creators of a persuasive technology must ensure that it regards the privacy of users with at least as much respect as they regard their own privacy.
- 5) Persuasive technologies relaying personal information about a user to a third party must be closely scrutinized for privacy concerns.
- 6) The creators of a persuasive technology should disclose their motivations, methods, and intended outcomes, except when such disclosure would significantly undermine an otherwise ethical goal.
- 7) Persuasive technologies must not misinform in order to achieve their persuasive end.
- 8) The Golden Rule of Persuasion: The creators of a persuasive technology should never seek to persuade a person or persons of something they themselves would not consent to be persuaded to do.

These principles cover the aspects of persuasion relevant in the HERMES project. By following them and incorporating the results of the interviews we strive for ethically sound persuasive components of the HERMES system.

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