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Abstract

We need a multidimensional and holistic approach to human-technology interaction (HTI) design in order to understand what technology could really offer for people and in what forms and on what terms it would be welcomed and adopted. To answer this challenge, a new holistic design paradigm Life-Based Design is introduced in this book.

The design of HTI should consider the additional value that technology brings to users. Technology should exist not for itself, but rather for bringing added value to the everyday of people, thus improving the quality of people's life. Therefore the aim of HTI should be to consider the human-technology interaction in a much larger context than within the context of using technology. In addition to physical usage environment, the impact of, for example, psychological and social environments of the users should also be taken into account in the design. This calls for a holistic consideration of the problem at hand, without necessarily getting off the ground with technology first in mind as the primary solution.

As the grounds for the design should be in a richer and more comprehensive appreciation of human-technology interaction, the starting point of the design should be in comprehension of people's lives. This is especially important now as technology development is focusing more and more on developing services besides technologies. Design of service concepts, if any, has to be carried out with a much broader design approach than what the traditional approaches to human-technology design can offer.

Mere investigation of the elements of life is not enough to guarantee successful design outcomes. We need to have well-grounded methods and tools for the design which can utilise our investigations of life and implement this knowledge into the design work. The basic concept in Life-Based Design paradigm is 'form of life'. With this concept it is meant any systems of rule-following actions in

people's lives. Forms of life offer a simple but very usable approach to examine life in all kinds of situations. They define what people do by defining their rule-following actions and attributes in a context. With the construction of a description of a form of life it is possible to get an idea about what ICT-designers can do to improve the lives of the people sharing that particular form of life.

Defining components of a form of life is a critical step in the design. It allows designers to understand how people could be supported in their pursuit towards the goals they have in participating in a particular form of life. Following the paradigm introduced, the rule-following actions and design-relevant attributes can be explicated and configured to technology-supported actions (TSAs). Creating the descriptions of TSAs enables designers to define problems accurately and to concentrate on designing solutions for them.

The holistic perspective to ICT design is discussed in this book in a context of older adults and gerontechnology by reviewing the main ideas and findings of the field. This material provides us with a concrete conception of how forms of life can be investigated to direct the development of new technologies.

The aim of Life-Based Design is the use of vital understanding about people's life as the basis of the creation of design ideas and concept design, to guide the whole development process of products and services. It is thus the kind of activity which should be carried out first in the development process. It will produce decisive information for further phases in the development process.

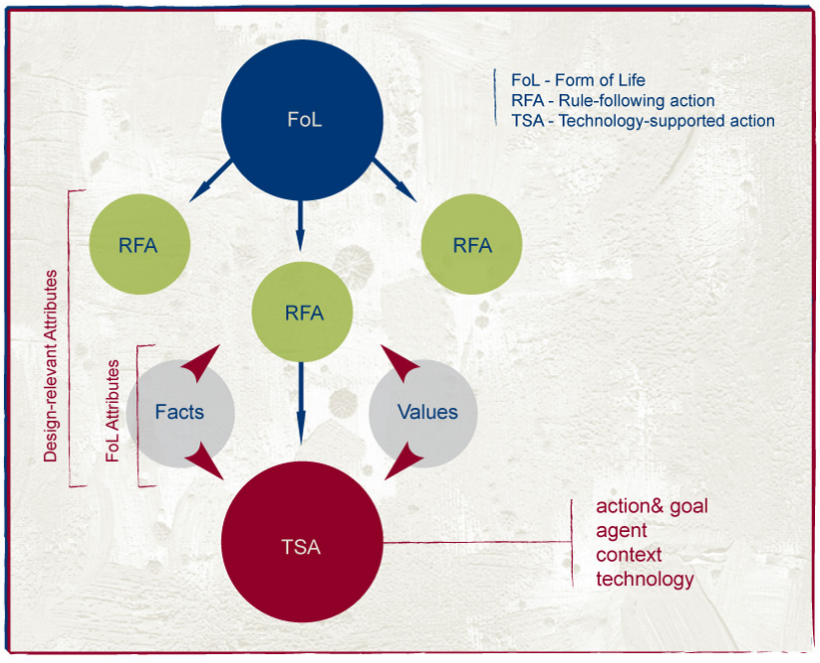
This book is a synopsis of an academic dissertation: Leikas, J. (2009). *Life-Based Design. Form of life as a foundation for ICT design for older adults*. Jyväskylä studies in computing 105. Jyväskylä: Jyväskylä University Printing House.

Tiivistelmä

Tarvitsemme moniulotteista ja kokonaisvaltaista näkökulmaa ihmisen ja teknologian välisen vuorovaikutuksen kehittämiseen. Sen avulla voimme ymmärtää, mitä teknologia todella voisi tarjota ihmisille sekä missä muodossa ja millä ehdoilla sitä oltaisiin halukkaita käyttämään. Tässä kirjassa esitellään uusi holistinen suunnittelunäkökulma, elämälähtöinen suunnittelu (*Life-Based Design*).

Teknologian tehtävänä on tukea ja parantaa ihmisten elämänlaatua. Hankimme ja käytämme teknologiaa aina tietystä syystä, saavuttaaksemme tiettyjä päämääriä, joita asetamme itsellemme jokapäiväisessä elämässämme. Teknologian tulisi olla tukemassa toimintaamme näiden päämäärien tavoittelussa. Tämä on mahdollista vain, jos tuotteiden ja palveluiden suunnittelun keskiössä on ihminen eikä itse teknologia.

Motivaatio tämän kirjan tekemiseen on noussut teknologian kyvyttömyydestä huomioida riittävästi ihmisten elämänmuodon ominaispiirteitä. Perinteinen käyttäjäkeskeisen suunnittelun prosessinäkemys (h*uman-centred design*, HCD) on keskittynyt enemmän tekniseen näkökulmaan kuin teknologian rooliin ihmisten elämässä. Tämän kansainvälisiin standardeihin nojautuvan suunnittelunäkemyksen lähtökohtana on jo olemassa oleva visio toteutettavasta tuotteesta ja käytettävästä teknologiasta. Näkemyksessä suunnittelu alkaa siten jo aikeesta kehittää juuri tietty tuote tai sovellus. Se ei kerro, miten tarve juuri tämän tuotteen kehittämiseen on ymmärretty – toisin sanoen miten on voitu varmistua siitä, että suunnittelu tulee ylipäätään tuottamaan käyttäjien elämän kannalta mielekkään, tarpeellisen ja halutun tuotteen.



Kuva 1. Suunnitteluideoiden johtaminen elämänmuodosta käsin elämälähtöisessä suunnittelussa.

Hyvin suunniteltu tieto- ja viestintäteknologia palvelee arkipäivän elämäämme. Mutta mistä saada eväitä suunnitteluun, jonka myötä teknologia voisi tämän tehtävänsä täyttää? Jotta teknologia parantaisi elämänlaatuamme, tulee sen kehittämisen lähtökohtana olla näkemys ihmisten elämästä. Tässä kirjassa esitellään elämälähtöisen suunnittelun kokonaisvaltainen suunnitteluparadigma (Kuva 1), joka perustuu elämän käsitteelliselle tarkastelulle.

Suunnittelu saa alkunsa aina ideasta. Elämälähtöisessä suunnittelussa ideat johdetaan elämän tarkastelusta. Elämän tarkastelun peruslähtökohtana on *elämänmuodon* käsite (*form of life*, FoL). Elämänmuodolla tarkoitetaan mitä tahansa säännönmukaista toimintaa, jota ihmiset toteuttavat elämässään. Elämänmuoto tarjoaa yksinkertaisen ja tehokkaan tavan tarkastella elämää erilaisissa tilanteissa ja ymmärtää ihmisten toimintaa tietyssä kontekstissa.

Elämänmuoto koostuu *toisiaan tukevista sääntöjä seuraavien toimintojen järjestelmistä* (*rule-following actions*, RFA), joita ihmiset arkipäivässään toteuttavat. Näiden toimintojen taustalla vaikuttavat elämänmuodon attribuutit. Näitä attribuutteja ovat ensiksikin tiettyyn elämänmuotoon liittyvät *faktat*, kuten käyt-

täjien ikä, tietotekniikkataidot ja näkökykyyn, kuuloon, muistitoimintoihin ja motoriikkaan liittyvät tekijät. Toiseksi ihmisten sääntöjä seuraavaan toimintaan liittyvät tietyssä kontekstissa *arvot ja normit*. Niitä voivat olla esimerkiksi tarve sosiaaliseen kanssakäymiseen ja itsenäiseen suoriutumiseen sekä yksinäisyyden tunteen lieventäminen. Näin ollen suunnittelun lähtökohtana toimivat sääntöjä seuraavien toimintojen, faktojen ja arvojen kautta ihmisten tarpeet. Tämä on ”käyttäjätarpeiden määrittelyä” laajempi ja syvällisempi näkökulma, eikä sitä tule erottaa ihmisten arkipäivän kokonaisuuden tarkastelusta.

Yleisesti ottaen inhimillisen toiminnan taustalla on tietoisuus omista tarpeista ja suunnitelmista näiden tarpeiden toteuttamiseksi. Tarpeet liittyvät tunteisiin ja määrittelevät yhdessä tunteiden kanssa sen henkilökohtaisen lisäarvon, jonka ihmiset asettavat tuotteille ja tavaroille. Täten tunteet, tarpeet ja motiivit avaavat elämänmuodon ohella uuden näkökulman suunnitteluun. Siksi elämälähtöisessä suunnittelussa kysytäänkin ensin, mihin teknologiaa ylipäätään tarvitaan. Tämän jälkeen voidaan tarkastella, miten teknologia voisi kyseisessä kontekstissa tukea ihmisten toimintaa heille tärkeiden päämäärien saavuttamiseksi.

Tietyn elämänmuodon sääntöjä seuraavien toimintojen järjestelmien sekä niiden taustalla vaikuttavien faktojen ja arvojen analyysin pohjalta voidaan määrittää *suunnittelua ohjaavat attribuutit* (*design-relevant attributes*) käsillä olevalle ongelmalle. Teknologia voi tukea sääntöjä seuraavien toimintojen järjestelmiä. Monet esimerkiksi käyttävät autoa kesämökille matkustaessaan, jolloin auto on väline – teknologia – kesämökille siirtymiseen. Auto on siten tyypillinen kesämökkiläisen elämänmuotoa tukeva teknologia. On kuitenkin tärkeää ymmärtää, että kaikkia sääntöjä seuraavien toimintojen järjestelmiä ei ole välttämätöntä eikä mielekästäkään tukea teknologian avulla. Esimerkiksi koiran omistaja tuskin kaipaa koiransa ulkoiluttamiseen teknologiaa, mutta jos koira sen sijaan jatkuvasti haukkuu ollessaan kerrostaloasunnossa yksin, voidaan käytöstä yrittää muuttaa teknologian, esimerkiksi erityisen haukuntaan reagoivan kaulapannan avulla. Koiran omistajan elämänmuodossa on näin ollen teknologian näkökulmasta sekä potentiaalisia että merkityksettömiä toimintojen järjestelmiä.

Tämä ero eri toimintojen järjestelmien luonnehdinnassa korostuu, kun tarkastellaan jälkimmäistä esimerkkiä *teknologian tukemana toimintana* (*technology-supported action*, TSA). Teknologian tukema toiminta on merkittävä elämänmuodon tarkastelusta nousevan suunnittelun näkökulmasta, sillä teknologia mahdollistaa tämän toiminnan toteuttamisen. Toiminta määritellään suunnittelua ohjaavien attribuuttien eli tietyssä kontekstissa toteutettavien merkityksellisten

toimintojen järjestelmien ja niiden taustalla olevien elämänmuodon attribuuttien (faktat ja arvot) avulla.

Kun siis olemme tarkastelleet tiettyä elämänmuotoa, määritelleet siihen liittyvät sääntöjä seuraavien toimintojen järjestelmät ja niiden taustalla vaikuttavat faktat ja arvot sekä tuottaneet näistä suunnittelua ohjaavat attribuutit, voimme siirtyä tarkastelemaan, miten näitä toimintoja voidaan tukea teknologian avulla. Näin pystymme määrittelemään joukon teknologian tukemia toimintoja.

Teknologian tukemat toiminnot sisältävät suunnittelun kannalta merkittäviä elementtejä. Näitä ovat 1) toiminto ja sen päämäärä (*action and goal*), 2) toimija (*agent*), 3) konteksti (*context*) ja 4) mahdollinen teknologia. Nämä elementit on mahdollista määritellä analysoimalla elämänmuodon attribuutteja.

Teknologian tukemien toimintojen kuvaaminen sääntöjä seuraavien toimintojen järjestelmien analyysin ja suunnittelua ohjaavien attribuuttien avulla mahdollistaa suunnitteluongelmien tarkan määrittelyn. Näiden kuvausten avulla voidaan tuottaa osaongelmia, kuten kuinka saada ihmiset luottamaan suunniteltavaan palveluun, kuinka palvelu hankitaan tai kuinka palvelu voitaisiin maksaa luottokortilla helposti ja intuitiivisesti. Lopullinen tuote- tai palvelukonsepti on täydellinen kuvaus toisiinsa integroitujen teknologian tukemien toimintojen järjestelmästä. Tämän konseptikuvauksen toimivuus riippuu sen kyvykkyydestä tukea elämänmuotoa teknologian avustamien toimintojen avulla – toisin sanoen siitä, kuinka huolellisesti sääntöjä seuraavien toimintojen järjestelmät ja niihin vaikuttavat suunnittelua ohjaavat attribuutit on analysoitu.

Elämälähtöisessä suunnittelussa on tärkeää, että loppukäyttäjät osallistuvat suunnitteluprosessiin. Suunnittelijan on mahdotonta ymmärtää tiettyä elämänmuotoa ilman välitöntä kontaktia tämän elämänmuodon edustajiin. Elämänmuotoa koskevan tiedon keräämisessä voidaan käyttää apuna esimerkiksi yksilö- ja ryhmähaastatteluja, työpajoja tai etnografista tutkimusta. Myös heti sen jälkeen, kun suunnitteluideat ovat konkretisoituneet ja saaneet visuaalisen muodon, loppukäyttäjät ovat jälleen merkittävässä roolissa konseptien viimeistelyssä. Tässä vuoropuhelussa voidaan käyttää apuna esimerkiksi fokusryhmiä tai muita osallistavan suunnittelun menetelmiä. Loppukäyttäjien kanssa käytävän vuoropuhelun tulisi sisältää niin tuotteen hankintaan, käyttöön kuin sen käytöstä poistamiseenkin liittyviä kysymyksiä. Siksi on tärkeää, että loppukäyttäjät osallistuvat suunnitteluun jo sen varhaisessa vaiheessa, toisin sanoen elämänmuodon analysoinnin ja kuvaamisen sekä teknologian tukemien toimintojen kuvaamisen aikana.

Elämälähtöinen suunnittelu painottaa alkuvaiheen suunnittelun merkitystä koko suunnitteluprosessin kannalta. Se on merkityksellinen varhaisen vaiheen

suunnittelun paradigma kahdesta eri syystä. Ensiksikin se tuottaa analysoituja käyttäjävaatimuksia konseptisuunnitteluun ja ohjaa siten tuotekehitystä koko suunnitteluprosessin ajan. Toiseksi se on merkittävä innovoinnin ja ideoiden tuottamisen työkalu. Kuten jo todettiin, tällä varhaisen vaiheen suunnittelulla on ollut usein vain vähäinen painoarvo muissa suunnittelumenetelmissä. Kuitenkin ideoita kehitettäessä ihmisten elämän tulisi olla perimmäisenä suunnittelua ohjaavana lähtökohtana. Elämälähtöisen suunnittelun tuottamien attribuuttien avulla on mahdollista ymmärtää, mikä merkitys ja lisäarvo teknologialla voisi olla ihmisten arkielämässä ja elämänlaadun parantajana.

Elämälähtöinen suunnittelu tuo suunnitteluprosessiin nykyisiä menetelmiä holistisemman näkökulman. Se linkittyy perinteiseen käyttäjäkeskeiseen suunnitteluun asettamalla prosessin alkuun elämänmuodon analyysin, jonka tulisi ohjata suunnittelua koko iteratiivisen kehitysprosessin ajan. Näin se korostaa suunnittelussa ihmislähtöisyyttä ihmiskeskeisyyden lisäksi. Elämänmuodon analyysi eroaa strategisesti perinteisestä konseptisuunnittelusta siinä, että se ankkuroituu ihmis- ja sosiaalitieteisiin ja tuottaa tieteellistä tietoa ihmisten elämänmuodoista näiden tieteiden koeteltujen ja vakiintuneiden menetelmien avulla. Elämänmuodon analyysi ja suunnittelua ohjaavien attribuuttien tuottaminen ohjaavat täten strategisesti koko suunnitteluprosessia. Teknologian tukeman toiminnan analyysin lähtökohtana ovat käyttäjien elämään perustuvat preferenssit. Perinteinen konseptisuunnittelu taas alkaa useimmiten tilanteesta, jossa tiedetään, että uutta teknologiaa tarvitaan ja mitä teknologiaa aiotaan kehittää. Konseptisuunnittelu on täten teknologiakeskeisempää kuin elämälähtöinen suunnittelu. Elämälähtöisessä suunnittelussa huomio ei kohdistu ensisijaisesti teknologiaan vaan elämänmuotoon. Suunnittelu tuottaa konseptikuvauksia ihmisen toiminnan näkökulmasta ja toimii siten niin valmistavana vaiheena konseptisuunnittelulle kuin tietopohjana koko suunnittelu- ja kehitysprosessille.

Tässä kirjassa on käytetty esimerkkinä elämälähtöisestä suunnittelusta ikääntyville suunnatun teknologian suunnittelua. Elämälähtöisen suunnittelun viitekehys sopii kuitenkin holistisena näkökulmana kaikkia elämänmuotoja tukevien teknologioiden suunnitteluun elämän eri konteksteissa.

Tämän kirjan sisältö on tiivistelmä väitöskirjasta Leikas, J. (2009): *Life-Based Design. Form of life as a foundation for ICT design for older adults*. Jyväskylä studies in computing 105. Jyväskylä: Jyväskylä University Printing House.

Contents

1. Introduction to the contents of the book

In this book I will present the difficulties of traditional design approaches to holistically consider the need for technology in people's lives and thus comprehend the added value that technology could bring to people. I will show that the current trends in the design and development of ICT products and services seldom truly manage to support the goals that people have in their lives. There is a need for a new design thinking and re-evaluation of the foundations of human-technology interaction design. *The grounds for the design should be in a richer and more holistic appreciation of human-technology interaction and the starting point in comprehension of people's lives*. This is especially important now as technology development is focusing more and more on developing services besides technologies. Design of service concepts, if any, has to be carried out with a much broader design approach than what the traditional approaches to human-technology design can offer.

My proposal is to adopt 'Life-Based Design', with the premise in 'forms of life' as a basic concept for human-technology interaction design. In order to gain understanding on where to go and which aspects to stress in the product design from the user's point of view, it is crucial to understand how the users perceive their everyday life, and what kinds of restrictions and incentives they have in their daily activities. This understanding can be gained through examining the forms of life of the users and bringing this knowledge into the design environment. Our everyday life is constructed by different forms of life which in turn affect significantly our goals in life. We participate in forms of life through sharing the rules and regularities that are included in them. Studying these regularities offers a possibility to comprehend the goals and needs of the users.

Chapter 2, Traditional design thinking. I will start this book by introducing challenges in human-technology interaction (HTI) design and traditional thinking in this area. I will present common approaches to design and explain how all

of them more or less concentrate on designing technology from a point of view of the usage of technology instead of designing for people's lives. Then, I move on to inspect some new design approaches which have somehow included the connection of technology and people's lives in their thinking, although still more or less focusing on the usage situation. I will also describe the inability of all these approaches to holistically consider life in the design and thus produce successful artefacts that would support people's lives. In doing this I will use as an example the issue of 'silver markets', a huge and neglected market potential created by older adults, and failures in the design in this area. From here forth I will focus on investigating possibilities for designing for life. The remaining chapters will be used to explain why and how we could develop such a design approach, and what it would mean for practical design.

Chapter 3, Towards designing for life. In this chapter, I move on to discuss everyday life as a distinct challenge for the design and claim that the importance of life has been underplayed in technology design. I will argue that understanding life is a prerequisite for understanding the goals of people and thus the goals for the design. I will introduce traditional concepts to capture aspects of life and explain why these mostly sociological concepts do not have sufficient power of expression to provide us with the knowledge of what is relevant in designing for life.

Chapter 4, Form of life. In this chapter, the discussion is moved to a more analytical level in respect to the concept of life. I introduce here the concept 'form of life' as a conceptual tool for designing for life. By 'form of life' it is meant any system of regular actions carried out by people. The systems of regularities in older peoples' lives provide here an example of a form of life. An analysis of 'form of life' and related notions is carried out. In addition, I give some examples of the connections between technologies and forms of life.

Chapter 5, Testing and developing the core concept – older adults' form of life. In order to fully comprehend the concept 'form of life', this chapter gives the reader a pragmatic account of the concept. Here, I will show how to construct a description of a form of life, and test this core concept by examining different forms of life of older adults. I will present the concepts relevant in analysing forms of life. These consist of rule-following action, facts and values.

Chapter 6, Life-Based Design. Mere understanding of forms of life is not enough to guarantee successful and desired products or services. We need to incorporate this knowledge in the design processes adequately and efficiently. Therefore, in this chapter I present a model for Life-Based Design, where the knowledge of the forms of life of the users is adopted in the very beginning of

the design process and carried along the whole design. The key idea is that rule-following actions, facts and values can be used to derive technology-supported actions (TSAs), which direct technical innovation processes on the ground of deep understanding of the relevant forms of life.

Chapter 7, Information society with a human face concludes this book by presenting the aspiration of Life-Based Design in the information society. In this chapter I discuss different human-technology interaction areas from the perspective of information society and older adults. With the help of the examples presented, it should be possible to understand why a new paradigm, Life-Based Design, is needed in HTI design.

2. Traditional design thinking

2.1 Challenges of interaction design

New information and communication technologies have become a significant part of our daily life at work and in leisure activities. These technologies are visible to us in devices, tools and services that we use. An increasing number of actions in everyday life are realized with the help of ICT technologies. We might even use the same devices for different purposes in different areas of life. Take the mobile phone, for example. It is used at work as well as during free time, although for different purposes. Most of us carry that device at all times, and for many the sound of the mobile phone's alarm clock is the first that one hears in the morning. In addition to all this, the mobile phone is said to have become a personal object that we use to express our identity and our life style (Glotz et al., 2005; Kopomaa, 2000; Leikas and Lehtonen, 2007; Väänänen-Vainio-Mattila and Ruuska, 2000).

New technologies are visible but also invisible in many ways. They are becoming more and more ubiquitous and ambient in our daily environments. Computers are embedded in all kinds of machines and devices, such as cars, washing machines, and cameras, to mention but a few. In addition to everyday things and artefacts, an increasing number of services are realized by ICT-technology, and many of them already by mobile technology. Indeed, ICT technology developers are focusing increasingly on service development, where the combination of mobile computing and technologically embedded environments create a major challenge. The technology challenges also users, as the environments become more complicated, and at the same time the performance capacity of devices increases. Also, the appearance and functionality of new appliances may be unfamiliar to users in their current everyday life. All this means that risks for errors and failures may grow when people try to control these complicated devices and

environments (Kaasinen and Norros, 2007). In addition, interaction problems shall be increasingly difficult to cope with in cases where technology is no longer directly controllable by the users' will, but is based on prewired assumptions on how people behave.

The new ICT technology issues, such as embeddedness and mobility, are changing our relationship to our environment, to other people and even to ourselves. In this societal change created by technology development it is important that humanity and human values are kept as a guideline for directing the design of technology and information society in general. How people treat each other becomes visible, for example, in the democracy of technology adoption and ethicality of social practises. Technology development facilitates the emergence of countless possibilities on which to build our future world. It should thus not be undertaken without conscious ethical consideration. The questions that should be underlined are, for example, who can and may use technology, on what terms, and what would be the consequences of this usage.

Inequality of access to ICT technologies has created a gap between different groups of people. The gap has always been there between those who can make effective use of ICT technology and those who cannot. This gap, 'the digital divide' is a phenomenon caused by the failure in technology development to sufficiently consider democratic accessibility and adoption of products and services. Indeed, there has been a lot of academic discussion about the growing emergence of digital divide (Digital Divide Network; OECD, 2002; Wills, 1999), of technological 'haves' and 'have-nots' (Howland, 1998; US Department of Commerce, 1995) or the 'information rich' and information poor' (Black, 1986; Wilson, 1987), and also of 'digital natives and digital immigrants' (Prensky, 2001). That divide is no longer seen merely as an issue of access to hardware. Instead, there is now growing concern that the lack of design foresight is creating social exclusion. Now, more than ever, unequal adoption of and access opportunities to ICT exclude many from benefiting from the advantages related to the introduction of technologies in many fields of social life (Mancinelli, 2008.) As technologies have evolved and their use also changed qualitatively, the divide is seen as separating users from non-users, and distinguishing different types of users. There is not just one digital divide any more, but multiple divides which relate to a variety of factors, such as living and work conditions, ethnic background, gender and age.

The design of appliances and services should not only prevent errors and guarantee productive usage of technology – it should fundamentally change

these. The fast development of technology facilitates huge possibilities for all of human kind, but as it is often the case, this progress is not automatic and unproblematic. There are also noteworthy risks in the design, due to which we must have a good, reflective and explicit understanding of the design process in order to minimize design errors. The development of technology is so vital to mankind that there are no alternatives for this. We have to ask ourselves if we truly comprehend the process of human technology interaction design as thoroughly as we should. If we do not, and in case there are any grey areas in the map of the design process, we should ask what could be done to improve this process.

2.2 An example of underestimated possibilities: silver markets

One way to comprehend different aspects in human-technology interaction design is to take an example of a problem area which might expose these aspects on a practical level. One such area is designing for older people. My purpose is not to argue that no important and innovative work is carried out here, but to ask whether we have done nearly all we should, and if not, why not. The answer to these questions may give us a reflective perspective to the whole human technology interaction design process. If we have missed something essential with design for older adults, we may have missed it in other cases as well. A concrete example of silver market is a good way to start to examine if the design for older people really is as well defined, opaque and unproblematic as it should be.

2.2.1 An increasing need for products and services for the ageing population

As the population ages, the need for different services in the society, especially for independent living, work and leisure time, as well as wellbeing and health, is naturally increasing. At the same time, older adults constitute an increasing number of the users of commercial services. Understanding the needs of older adults is more important than ever, and meeting these needs will represent a major market opportunity for new ICT products and services on international ‘silver markets’.

The technology for the ageing population easily raises images of illnesses and disabilities and respectively of products and services aiding to compensate for these problems. Indeed we need devices which could, for example, make it eas-

ier to move around or compensate for the decline in vision associated with the old age. In the future, however, there shall be a substantial number of ageing people who are wealthier and more independent and whose needs as consumers are much diverse and not only related to illnesses or disabilities. On one hand, of course, product preferences are coloured by the worry of decreasing cognitive and physical capacities. On the other hand, however, active seniors of the large age cohort, 'the baby-boomers', will turn their attention to products and services which advance their own well-being (Gilleard and Higgs, 2005) and increase their quality of life (Steg et al., 2006). Thus, technology development is confronted by two challenges in terms of the needs of older adults. Firstly, it should satisfy the needs of rather healthy older adults who have relatively good ICT skills and whose needs are shared by other groups in society as well. Secondly, it should also serve older people with lower ICT skills and very specific needs associated with the effects of ageing. From the markets' point of view those two segments are totally different.

Although pension provision policies vary significantly among different countries, in most Western countries there is a significant market created by well-off older adults who can afford and are willing to pay for products and services that could support their desired way of life and quality in it. Ageing people do not only own substantial amounts of money but they are also willing to pay for good services. For example, in the United States 70-year-old people lay out money on products and services more than 30-year-old people do, and elderly people possess over 75% of all financial assets, own nearly half of the credit cards and purchase over 40% of all new cars (Sherman et al., 2001). According to the studies by the German Institute for Economic Research, over 60-year-old consumers formed 41% of the total private consumption in 2005 (BMFSJ, 2007).

The growth on silver markets thus opens up new challenges for the development and export of products and services. The critical question is how to adapt the design to these markets. The preconditions for the success on the market can be discovered through understanding the everyday life of older adults and the context of becoming old in modern society. On the future markets it is essential that the needs and hopes of older adults are taken seriously, and new business models based on these are found. It is also essential to be able to improve the visibility, interoperability and compatibility of the products.

It can be asked if the potential of silver markets is sufficiently understood. To gain further understanding on this it is necessary to consider the aspects of ICT usage by older adults. These will be introduced in the following chapter.

2.2.2 Older adults' ICT usage in Europe

In 2001, a SeniorWatch project carried out a market study about the specific ICT needs of older persons. The project gathered data from almost 10 000 European citizens aged 50 years and older. According to this study, a considerable proportion of the population aged 50+ in Europe had already gained experience on a personal computer. The more detailed results of this study show that 56.8% of 50–59-year-old, 31.6% of 60–69-year-old, 19.0% of 70–79-year-old and 16.0% of 80+-year-old Europeans have a PC at home already (SeniorWatch, 2002). However, home access to a personal computer among European older adults is quite unevenly distributed across the European Union. According to the SeniorWatch report (2002), over 50% of the population aged 50+ in the Netherlands, Denmark and Sweden have access to a computer at home. Germany, Finland, Belgium, the United Kingdom and Austria are above the EU average as well, whereas access rates for Italy, Luxemburg, France, Spain, Greece and Ireland are below the average. In Portugal, only one out of nine senior citizens has access to a computer at home.

One example of older adults' ICT usage is *the Internet*. Clearly, older adults use far too little Internet based services and there are too few services targeted for older adults. One can even speak of *under-use* (Kämäräinen and Saariluoma, 2007). The Internet has begun to enter the European senior market. Only 22% of the European older adults lived in a household with Internet access in 2002. However, the market is heading for growth, and the number of older Internet users is expected to grow quickly.

One could think that the Internet is a suitable means for communication as it enables people to reach a huge number of information sources, and makes it possible for people to meet each other through communication groups. It allows smooth and unhurried operation, which is quite different from using a phone, for example. In addition, all this can be done at one's own desk at home. Many older people still find it difficult to use the Internet but younger older adults, who are computer literate and well-prepared and already use the Internet increasingly for communicating and learning, e.g., about health care, will insist on quality services in their old age.

According to a recent SeniorWatch2 research (SeniorWatch2, 2008), Finnish people who are 50-year-old or over are industrious Internet users. In an EU research, the use of the Internet was familiar to people aged 50–59 years (60%). The research concludes that educational background has great importance on

how people can use the Internet or computer technology in general and how they can benefit from it. This study has been criticized by civic organizations of ageing people, for giving a too positive image of the technology use of Finnish ageing people by fixing the old age to cover only the ages between 65–75.

According to Finnish studies, the ways to use the Internet are very similar regardless of whether the user is young or old, a working person, student, entrepreneur, or unemployed (Nurmela et al., 2002; Vuori and Holmlund-Rytkönen, 2005). From the different ways of using Internet, e-mail is the most common one, but almost as often the Internet was used to search for different kinds of information or just for unspecified surfing. The search for information of goods and services was equally common in all Scandinavian countries. The usage of Internet based banking services was most common, proportionally speaking, in Finland. Two out of three persons had used Internet based banking in Finland while, for example, in Denmark only half of the Internet users used it for banking services. (Nurmela et al., 2002.)

Often the aged people do not like to use the Internet, because it is seen as difficult to use and its content found irrelevant (Cleaver, 1999; Czaja and Lee, 2003; Mittilä and Antikainen, 2006). The scene on the screen may appear confusing, and it is difficult to find out the relevant information. In addition, decline in vision, hearing and motor functions make the use of technology even more difficult. Also, religious reasons can explain the non-usage of the Internet. In addition, technofobia is a common reason for those who are not familiar with computers, and indeed, many people are afraid of breaking the device in question (Hussain et al., 2008). Moreover, in older people this often generates feelings of inadequacy (Eastman and Iyer, 2004).

Older adults demonstrate readiness and interest to use the Internet, when they can have coaching for it, when training is planned to meet their needs and enough time is reserved for it (Eastman and Iyer, 2004; Petäkoski-Hult et al., 2004). When investigating the use of the Internet among population over 55 years old and in long-term psychiatric care it was noticed that the use of the Internet and the e-mail may decrease depression (Hage, 2008). Often when older people have the possibility to use the Internet, they find it helpful and are ready to use it even for e-commerce. Older people find, however, that currently the public places with Internet connections are unpleasant and also, in many cases, difficult to access.

Another example of ICT usage is *the mobile phone*. It enables simple social communication but also increasingly plays a significant role in social interaction

and everyday life. For many people, it is an enabler of social interactions, hierarchies and communication. According to the SeniorWatch study in 2002, about 50 million older Europeans (with the age of 50 years and older) already possessed a mobile phone (SeniorWatch, 2002). Especially the younger age cohorts use mobile phones for their purposes. In those calculations, the number of senior mobile phone users was expected to be 71 million, and out of those 14 million were expected to face difficulties in the usage of the phone due to age related problems in vision, hearing and manual dexterity (SeniorWatch, 2002). In 2002, in Finland, Sweden, the Netherlands, the United Kingdom, Denmark, Austria, Germany and Belgium more than half of the population aged 50+ owned a mobile phone. However, penetration of mobile telephony among older Europeans is quite unevenly distributed across the European Union. While the usage was high in Scandinavian countries in 2002 – reaching a share of nearly 70% mobile users in their overall population aged 50+ – the usage was still low in Portugal (22%).

According to data collected in EU countries in spring 2002 (SIBIS, 2002), around 70% of 15-year-old people and people over that age had a mobile phone for their personal use. Measured in this way, Europe was clearly ahead USA. The density of mobile phones was the highest in Finland. According to the SeniorWatch2-research mentioned already (SeniorWatch2, 2008), the Finns of 50 years old and over were also frequent users of mobile phones and were placed on top in Europe both in having mobile phones and in sending SMS-(text) messages.

According to the Senior Watch results, for most of the older adults in Europe the primary use of their mobile phone was to function as a security device (51.6%) (Table 1). The phone was also used for one's own convenience (27.0%) and to communicate with family and friends (10.0%). Especially in Finland, mobile phones were also utilised for non verbal communication, i.e., sending short text messages (SMS). Based on the results, 77.9% of the Finnish older adults reported to have sent or received a short message via a mobile phone.

It is necessary to examine the Finnish figures in more detail. The figures show a high percentage of SMS users. However, it is worth noting that there are great differences between those who are 50 to 60 years old and those who are over 70. Based on my experience, older adults face substantial difficulties, due to the decline in their physical capabilities when using SMS. Thus, the high percentage of SMS users referred to above can be somewhat misleading.

Table 1. The main reasons for having a mobile phone among the EU 50+ population (%) (SeniorWatch 2002).

Age	For own convenience	For security reasons	To communicate with family and friends	For business or work
50–59	27.0	45.1	10.4	15.3
60–69	27.3	55.1	10.2	5.8
70–79	24.9	62.6	9.0	1.5
80+	35.9	49.6	9.9	2.0
Total	27.0	51.6	10.0	9.4

Lähteenmäki and Kaikkonen (2005) have analysed the adoption of mobile phones among older adults in Finland. They define two groups of adopters in their study: pre-war (76 years old on average) and post-war people (61 years old on average). In the pre-war group, around 60% of the group owned a mobile phone, whereas in the post-war group the percentage was 91. The individuals in both groups had purchased the mobile phone after they had retired. The main reasons for the purchase had been cottage life, travelling, and meeting friends and family members. Neither of the groups consisted of keen users of the Short Message Service (SMS), and the service was hardly ever used in the pre-war group.

Table 2 illustrates the significance of the mobile phone in different life areas and the salience of different sectors of these life areas in different age groups (Kopomaa, 2000). +++ indicates strong correlation whereas + indicates correlation that is less significant.

Table 2. Usage of the mobile phone in different life areas in different age groups (Kopomaa, 2000, p. 102).

	Free time	Family / Home	Work
Young	+++	+	+
Middle-aged	+	+++	+++
Older adults	++	(+)	-

The conventional fixed-line telephone was beneficial for older people in many ways. The evolution from being solely an audio system to one which also carries data has brought many new possibilities but many problems as well. Using the

screen to display text and graphics poses obvious problems for older people with the decline in their vision or cognitive capacity. Also the push buttons are very small and thus difficult to operate. In addition, the phones usually have too many unnecessary functions which hamper the usage of the necessary ones. (Bruder et al., 2006; Leikas and Lehtonen, 2007.) All in all, as an ageing perceptual system loses its ability to process fine detail in any sensory modality, it appears that mobile phones are "designed to handicap the older person" (Stuart-Hamilton, 2000, p. 216). One could even speak about the creation of 'mobile divide' to the disadvantage of non-mobile older people.

Although product developers have invested a lot in developing and marketing mobile phones, only few have models targeted for older people. It seems that mobile terminal developers and service providers have neglected ageing people as a target user group. The design of mobile phones has so far been based on the needs of young and active persons (Zajicek, 2005; McGuigan, 2005). The need for proper mobile phones for the aged has been acknowledged, but so far the developers have not been truly interested in satisfying this need nor in finding out about it.

Considering potential silver markets, the mobile phone usage by older people is not sufficiently understood. The design should pay more attention to normal age related decline in physical and cognitive capacities. "It is not being argued that every item should be designed to be age-impartial, but it is hard to see why manufacturers seem to want to exclude at least 20% of their potential market by making things difficult" (Stuart-Hamilton, 2000).

Statistics clearly show that older people do not use the Internet to its full potential nor benefit from it to the extent that would be possible. This means that currently the Internet is under-used by older adults. There are many possibilities for older adults with the Internet but currently these possibilities are not being used (Kämäräinen and Saariluoma, 2007). This is a serious problem as it slows down the development of the whole ICT society.

2.2.3 A chasm between "the technological haves and have-nots"

It is difficult to specify, in an unambiguous way, older adults as adopters of technology. This group is very heterogeneous and the experience of technology by its members varies remarkably. Older adults have different experiences of technology, which in turn affects their self-efficacy, willingness and know-how in adopting new technologies. For example, functional capacity, work history,

educational background and the number of friends or relatives interested in technology all have their influence on how comfortable and curious people are in respect of new technologies. Because of this we cannot say that, for example, all ageing people over 55 are capable or willing to use new technologies. Of course, there are those who are already skilful with ICT technologies, but there are also still many who are set against new technologies because of, e.g., lack of economical or social resources. In addition, for some people, dropping out of the technological development may arise from a conscious choice and ambition towards a technology-free lifestyle.

Ageing people face with increasing speed the fast technical development and growth of complexity in their environment. Nearly all public services employ information technology and this automation makes it harder for older people to run their errands. Also, ICT literacy is needed in many hobbies, such as adult education, and even social contacts are more and more organised through information and communication technologies. Everyone in the modern society should be able to take advantage of the ICT products and services offered by the society. Using information and communications technology is seen as "the indispensable grammar of modern life" (Van den Hoven, 1995; Wills, 1999). Without it one cannot fully participate in the society, plan one's life or express oneself.

ICT solutions and applications are very often designed from the perspectives of young and technically skilled people. Because of this, a part of older people has been left aside from the development of information technology. Therefore, older adults are divided into two groups. One half of them is technology oriented and experienced in using technology, thus using devices and services effectively (Leikas and Lehtonen, 2007). The people in this group know how to benefit from the Internet and mobile services in their everyday life. However, there is the other half, which comprises of technophobes and other technically non-skilled persons, who feel anguished because of the rapid changes in technical environment. They do not surf in the Internet and they use the mobile phone only for verbal communication. They feel that they do not have a leg to stand on in relation to technology (Goodman et al., 2003; Leikas, 2007).

This leads to a deepening chasm between some older adults and their technological environment. One can even say that as a part of the population has been closed out of new technological services, it is in a danger of becoming displaced from the information society, as well. This chasm should be recognized not only as a problem of present older adults, but also as a challenge in respect of future generations (Bagnal et al., 2006; Leikas, 2008; Leikas and Penttilä, 2007).

Technophobia is often used as an explanation for that older people have not adopted new technologies (Brosnan, 1998). The development of new technology outside the older people's world of experience and the partial mystification of technology make older people feel agony. Mystification is, among other things, a consequence of advertising, technological snobbism and technical jargon (Birman, 2005). Indifference has a specific meaning in this context: it is the unconcerned attitude in design processes towards older adults and the needs arising from their everyday life.

To avoid mystification, we should underline the responsibility of enterprises to communicate sufficiently about and to give training in ICT technology (Valtioneuvosto, 2008). Older people do not necessarily clearly understand the pros and cons of the products if they lack technical knowledge. Therefore they often have to rely on the information given by salespersons, friends and even in many cases by their own grandchildren. In fact, in many cases the younger family members, children and grandchildren, seem to make the decisions of adoption on behalf of their elderly relatives. The older the person is, the more difficult it is for him or her to understand and adopt new technology. In these cases the importance of help and support from other people increases.

Older adults have not yet fully adopted the public places for ICT usage, either. Although there are places in the community that facilitate the adoption and usage of ICT technologies, such as Internet Cafes and libraries, and even if people have potential physical access to the technologies, such 'access' is, however, meaningless unless people actually feel able to make use of such technologies. It is important to acknowledge the importance of an individual's perceived (or effective) access in practice over the theoretical (or formal) access to ICT, and define the 'access' from the individual's perspective (Selwyn, 2003). This perceived access arises from people's life. If the Internet café, for example, does not fit into the person's lifestyle, this possibility will be neglected never mind how useful it might be in the eyes of others.

2.2.4 Different personality types of technology adopters

To the ageing people of today the technological development and how it has become a commonplace phenomenon is not a new issue. In the course of their lifetime, appliances such as radio, TV, telephone and many domestic appliances, which are taken for granted by today's young people, have found their way to people's homes. Information society has speeded up the change. However, the

structure of consuming has changed and the goods have become increasingly complex. New technologies enable 24/7 society, in which artefacts, devices or services can be produced 24 hours a day and 7 days a week. This kind of e-society changes our conceptions of time and our time management. (Hämäläinen, 2006.)

Ageing people have different expectations towards the emerging technologies. These expectations have their origin in their everyday life and their needs in different areas of life (Leikas and Penttilä, 2007). One way to approach the issue of technology adoption is to examine it in the light of different personalities. Through examining personalities it is possible to find differences and similarities in people's ways of reacting towards new technologies. Jarvis (1992) has studied older people's attitudes towards new things in life. He has found three different types of people in respect to how they experience new things. These are: 1) the harmony seekers, 2) the sages and 3) the doers. The classification is suggestive and is naturally connected with the elements of the person's form of life, such as personality and functional capacity.

Most older people have spent their life trying to find balance and meaning between their own life and the world. But the world they have learned to know keeps changing. You can often hear older people wondering "where this world is going?" How do the older adults relate to changes? Do they continue developing themselves infinitely to achieve concordance with their world, or do they discover that the world is changing continuously and that they only have the chance of being in balance with the world they know? If they don't dare to take advantage of the world around them, they will abandon a possible learning experience and maybe the whole strange world around them. In that case they only use their own world and concentrate on safe and familiar things around them. Older harmony seekers might even close the strange new world totally outside them, to live in the familiar world of their own. In such a case the older person strives to reflect the world that is gone by and which only lives in that person's memories. In a way, "learning away" from the past is essential in order to keep together all the things that have made the person who he/she is now. (Jarvis, 1992.)

There are also ageing people to whom life continues to be an intellectual adventure. These older adults are considerate seekers, who want to live free from clear, life-restricting models. According to Jarvis (1992) this kind of an imbalance is always a beginning for learning. Nevertheless, old people, as well as most other people, don't have the time nor interest to seize every learning experience. However, they do have the liberty of being more selective than

younger people. They can choose the experiences that they want to learn from and reject others. These older adults have time to be reflective and critical learners and adopt new things to earlier experiences.

There are also older people who can't be situated in either one of the previous groups. We have an increasing number of healthy and active old people, who enjoy their retirement time for example by exercising sports, travelling or participating in church activities. For these older adults life is action. They learn both from their earlier and their present experiences. (Jarvis, 1992.)

By understanding different personalities it could be possible to perceive, to a certain extent, what kinds of products or services different people might want and what kind of technology they might benefit from. As personality reflects the individuality of a person, through examining personalities it could be possible also to understand the contents of individualism and consider how this topical demand for individualism in respect to different forms of life could be realised in product development for mass markets. In addition, different personality traits can explain people's commitment to different product brands. We could even talk about "brand personality", a phenomenon where different product brands entail symbolic value, such as success in work life or a fast way of life, and are thus found attractive due to their personal meaning and value to people (Aaker, 1997; Caprara et al., 2001).

Therefore, personalities are a significant factor considering human-technology interaction design. If we study the personality types mentioned above, it is not hard to understand that so far the design for older adults has been mainly focused on *dependent succourant* (care and attention directed towards individuals in distress) *and harmony seekers*. Yet, shifting the design from these traditional personality types to *constructive, focused doers* could open up totally new insights and major markets for many different products. (Jarvis, 1992.)

The personality categories by Jarvis can be viewed in the light of technology adoption, also. As they illustrate older people's responses to new experiences, they can also bring deeper understanding about older adults as adopters of technology. "The doers" live an active life. They are physically fit and enjoy their retirement time. As adopters of technology they would probably be curious and interested in learning new things and technology.

"The sages" are selective, choosing carefully the experiences that they will ignore. Having no sufficient interest to new technology, they would be somewhat critical towards technology. This group would include persons who would claim that they are not able to learn anything new anymore, and are happy to leave all

innovations to younger people. In this group there would also be persons who would judge technology by its price, feeling that most new technical solutions would probably be too expensive to use.

"The harmony" seekers want to be at peace with the world and reject the potential learning experience if they cannot control the world around them. Where technology is concerned, "the technophobics" belong to this group. These people would be concerned about whether they would be able to use any services apart from the very simple ones, and would fear life becoming more and more complex to live.

Older people are seldom early adopters of innovations. This is due to the fact that innovations are either technology driven or do not arise from the forms of life of older people. Also, older people do not usually have the knowledge about what the innovation is and how does it work. Innovations are most often targeted to younger users' forms of life. This explains the categorization to adopters of innovations by Rogers (2003). According to him, there are innovators, early adopters, early majority, late majority, and laggards. These categories illustrate the variability around the mean once 50% of the target population has adopted an innovation.

Rogers (2003) introduces some basic characteristics for each adopter. Innovators, persons who adopt the innovation first, comprise only 2.5% of all members of a social system. The members of this category are venturesome. They must be able to tolerate uncertainty and risks, which innovations incorporate. Normally these persons have technical knowledge and they may act as gatekeepers for the innovation. As they are the first persons testing the innovation, their role is important for the social system in controlling the information about innovations, although they may not be opinion leaders of the society. Early adopters (13.5%) are closer to the social system than innovators, which gives them often the role of opinion leaders. They are respected members of the society and have a significant role in disseminating information about the innovation to other members and in creating the critical mass of adoption. Early majority (34%) comprises the third of all adopters in the social system. These persons are active and important members in the communication structure delivering information, although they do not lead the discussion. Late majority (34%) is a large group (with one third of all members) of sceptical persons who believe that they can survive without innovations, and adopt innovations only due to social pressures or economic reasons. The norms of the social system play an important role for these persons. Finally, laggards (16%) are faith-

ful to good old practices and solutions. They are the last persons to adopt innovations, and many of the older adults belong to this group.

Already in the 1980's Schewe (1984) classified older people into three different groups according to their consumer behavior. The first group always looked for items with lower price in order to adjust costs to accord with their income. The second group wanted the best quality. For the third group the price acted as a status symbol. These groups can still be found among older adults, but in general, the consumer behaviour of ageing people has remarkably changed.

Both Rogers and Schewe neglect the category where many older adults belong to, namely the category of the non-adopters. This group of non-users consists of a significant number of older adults even in the Western societies when viewed through the usage of technology. We know that many of 55–75-year old people are familiar with, for example, the Internet, as many have used computers and browsers already in their work. However, there is also a large group of people in this age group who have never used any computers and still exhibit strong resistance and even feel hostility towards computer technology in general. Studies show (Leikas, 2007) that the main reason for older people's reluctance to use new technologies is the lack of know-how. Another reason, which is even more significant, is interfaces that are obscure and difficult to use. A substantial number of our active population grew up before the time of the Internet and mobile devices. This creates thresholds for learning how to use new services and devices. The height of this threshold varies with different user groups and services. Today's ageing people haven't come up against the information society until at the twilight of their working career or during their retirement age. At this stage one would have to start from scratch to learn to use the equipment, the technology and the services, usually without any education, training or peer support at hand. When the threshold for learning is high the services will not be used, and consequently older adults will stand aside from the essential services and communication networks of our society.

Mathur (1999) has also studied the adoption of technology among older people from a consumer socialization perspective. In his model he interprets adoption of technology within a socialization framework where agents or change agents are studied. These can be family members, children or grandchildren, who may act as triggers for cognitive steps (awareness and interest of technology) and behavioural steps (trial and adoption of technology). Mass media and non-family sources like friends or nursing staff can also have a positive influence on the adoption of technology. The better the socio-economic status of a

person is due to, e.g., income and education, the more it increases the importance of mass media sources in the adoption decisions. As an example, educated persons are more capable for following technical news.

Motivation explains partly the adoption threshold, and it is an essential issue how to motivate people to adopt new services or products. Other essential issues include how to make people acquire the knowledge and know-how they need, and how to get them to see the opportunities opened up by new technology (Saariluoma, 2004).

The research made on the motivation of using new technology among older adults is disparate. In general, ageing people have appeared interested in technologies when they see sufficient benefits in them for their own life and when the products are easy to use (Bronswijk, 2006; Czaja and Lee, 2003; Selwyn, 2003; Leikas 2007; Leikas and Saariluoma, 2008a; Mead et al., 2000). On the other hand, technophobia is common among older people (Ellis and Allaire, 1999), but, nevertheless, can disappear as a consequence of direct (Kelley and Charness, 1995) or indirect (Rogers and Fisk, 2000) positive experiences and improving skills (Ellis and Allaire, 1999).

The rejection of technology may also have very individual reasons. They are not always in the ageing-underlining design or poor usability, though these are the most common reasons. The willingness to adopt technologies depends also on the values that people follow during their life. It is essential that the technology in question responds to the values of the ageing people. Of course, these values may be and often are contradictory to the values of young people. The values of older people are associated with, for example, everyday activities, hobbies and traveling (Leikas and Saariluoma, 2008b). On one hand, the services for ageing people should have high quality, offer value for money and support one's own well-being. On the other hand, the need for support and compensation of functional deficiencies in everyday performance is valued. These needs should act as the starting point for developing technologies and services for older adults.

For example, compared to efficiency, ageing people may give more importance to costs, i.e. a low price of a product (Melenhorst, 2006), or to ease of learning (Leikas and Saariluoma, 2008a). The heterogeneity of ageing people is evident, as it is possible to find subgroups among older people. Some of them follow the consuming patterns of the young people (Pew Internet & American Life, 2003).

According to O'Brien et al. (2008), the differences in age groups in the usage of different technologies can be explained by different purpose of use. For example, while young adults use technology primarily for entertainment, older people are more likely to use it for wellness and health purposes. When purchasing goods, young adults usually use only one technology (the Internet), whereas ageing people use many different technologies (TV and telephone). In case of ageing people, the choice of a technology may be associated with the service more suited for their ends. According to the same research, young people in the US and Canada in general use the Internet more than older people do in those countries.

2.2.5 Where are the problems?

The previous sections have systematically shown that the design for older people is not in as satisfactory a state as one could hope it to be. There are numerous difficulties and obstacles for efficient adoption of technology. The needs of older people are obvious, but the technology needed is not always available. In the cases where technology exists, older people often face difficulties in using it. These are not small problems.

One can argue that the problems of technology adoption are serious on many different grounds. The most important ones are insufficient market supply along with social and ethical value. We must remember that older people have their own diverse needs and hopes towards new technologies as well as money to buy appliances and services to satisfy their desires. In addition, they are much wealthier than young people and capable of obtaining goods and services for their wellbeing. This is why it is unwise to put these people outside the scope of design discourses and practices.

It is also essential to keep in mind that older people can benefit from new technology: applications for fitness as well as wellbeing and health, among others, allow them to continue their active lifestyle. These applications can have remarkable influence in the lives of people and even make their active days of life longer. This in turn means significant savings for the society in the expenses of social and health care.

Finally, there is an ethical point of view, which should not be underestimated. Older people have made it possible for young and middle aged people to build the information society. They have been active in making it possible for science and schooling, for example, to become realized in the society. In addition, they

have built the infrastructures, such as buildings, transportations systems and effective health care systems as well as systems for producing food and clean water. Also, they have influenced the emergence of 'old time' technologies which have paved to way for new ones. Therefore, younger generations in a way owe much for them, and this is why it is ethically our duty to take them into account in the decision making concerning new information society.

In a deeper ethical sense, the present ICT-generation should ask, whether the present design approaches for older people satisfy the criteria that they would set themselves in their old age. Or would they perhaps think that they would also need to benefit from the future technology development as much as the younger generations. Indeed, the ethical obligations of younger generations to older ones is an eternal question, which in one form becomes concrete in the design of modern ICT-society.

We can see that there are really weighty arguments supporting the necessity of improving design for older people. It would be too easy to say that younger generations are selfish and self-centred. If they were, they would understand the significance and value of the silver markets. Besides, there is no reason to think that young people are any more unethical than any other generation before them.

An alternative explanation for many insufficient design outcomes may be in the design practices themselves. It may be that we really miss a good conceptual base to analyse old people's lives and living conditions. From a foundational perspective the reason for this can be found from the undeveloped design thinking with insufficient conceptual systems. For example, when we did not have a notion of an electron, we were quite unable to consider the problems of electricity, and when we did not have the notion of atom and molecule, our analysis of chemistry was poor. Similarly, when we still had no idea of the double-helix, the phenomena of genetics were very superficially understood in comparison with our understanding of it today. Consequently, it is possible that the concepts used in our design approaches in the same way are inadequate regarding the life of people.

Of course, it is not possible to completely ignore life in technology design, because basically all technology is developed for reaching goals in the lives of people. This means that all technology is connected to the way we live. We have an electric oven to make good food and a vacuum cleaner to make cleaning easier. This means that these products are effectively connected with practical human life. Technology has always been linked to people's lives, and this means

that the designers always have had some idea, conscious or unconscious, of how the designed technology is incorporated in the processes of life.

Nevertheless there may still be problems that remain unsolved. It is possible that we do not always understand the necessary elements of life, and this is why we are not able to satisfy the demands that they set for the design. Therefore, it may make sense to examine how the traditional ICT design approaches conceptualize the elements of human life. If they fail in systematically analysing life, it may be that the designers' thinking is biased by the absence of the elements of life.

2.3 Traditional HCI and HTI design

In the past, the role of user interface design was to facilitate successful operation of machines. Therefore, push buttons and handles were designed in a manner where they would best serve the smooth operation of the machine or device. The human was considered as another resource that has to be optimised in order to meet the goals of the operation (Noyes, 2001). When the research of human-computer interaction (HCI) started to gain ground, the influence of people as users was brought into discussion. However, in this point of view people's role was again to serve the 'good of the machine', i.e. to assure that the machine operated as expected. Therefore, the push buttons and handles were again developed from the technology point of view.

Even today most of human-technology interaction (HTI) design (also "human factors" and "ergonomics") (Noyes, 2001) is targeted at guaranteeing smooth and unproblematic operation of systems and services. User interfaces with input and operation models are still designed in terms of technology, although the input modes, the 'push buttons', may have been designed from the point of view of people. People are considered as 'users' of technology, and the designers determine what the users should be able to do in different steps of the usage of systems, products and services. In this practice, the users are placed in a situation where they have to accomplish certain tasks and goals, which most often are defined in terms of technology. Thus, the technology determines the right way and the correct operations that have to be carried out in order to fulfil the tasks and achieve the goals, and the usage of technology is assessed in such terms as efficiency and accuracy (Rasmussen, 1986; Reason, 1990).

In this approach, the designers determine what the users have to technically do in order to reach their goals. This approach can no doubt be called technology-

driven design. The perspective is totally limited to technology and does not fully consider the users' role as human beings and individuals who, instead of executing mechanical actions, themselves want to determine the goals for their activity. Instead of being extensions of technology people wish to exploit and take advantage of technology and even gain pleasure from doing it (Jordan, 2000; Leikas and Saariluoma, 2008b; Saariluoma and Leikas, submitted).

The primary research interest and objective of technology-driven design has been in understanding the technology development. The goal has been to produce ideas or models that contribute directly to design efforts. Also, the traditional design of HCI has been technology-driven with the emphasis on the usage of products, systems and interfaces. The most important thing in the human-computer interaction has been that people know how to *use* the products or systems. In this sense HCI can be seen more as an engineering discipline where, e.g., psychological theories of interaction are employed first and foremost as instruments for developing technology. For example, International Ergonomics Association defines human factors (ergonomics) as a discipline that "optimizes human well-being and overall system performance" (IEA, 2009). According to Noyes, (2001, p. xi) human factors seeks to "maximise safety, efficiency and comfort by shaping the design and operation of the technology to the physical and technological capabilities and social needs of the user".

The technology-driven approach can be found fundamentally in the international standard of human-centred design processes for interactive systems (ISO, 1999). This standard stresses the understanding of user requirements *in relation to the context of use.* Thus, the specification of user needs in this standard is wholly concerned with the usage of the intended product or system. In this traditional and widely followed approach, collecting and specifying user needs does not refer to examining the overall desires and hopes that people might have towards technology in their everyday life, but the focus is entirely in the usage situation of a specific product or system. This view has shaped the understanding of the narrow interpretation of the concept of 'user needs' and accordingly paved the way for respective design practises which have aimed at testing the features of existing device solutions or prototypes and thereby examining usability problems through user interface tests.

The weakness of traditional HCI research is that, with focusing on usage situations, it lacks the perspective of human life. As such it provides no concepts that would make it possible to study the real needs that arise from the contents of people's life and that could be fulfilled with the help of technology.

2.4 Human-centred and human-driven design

As noted, the traditional product design aims at designing products and services for specific users for specific usage situations. In these kinds of design processes the evaluation is focused on the product, and not, for example, on people's conventions of use. In 1970's the HCI research was conducted almost entirely by technology developers and scientists of engineering focusing mainly on technology and system design, inspired by computer science. Gradually the field has been taken over also by other disciplines, such as ergonomics, human factors and cognitive engineering, which aim at minimizing the problems in human activity caused by the complexity of technical environments (Nielsen, 1993; Woods and Roth, 1988). At the same time, the focus has been transferred from technology and 'quality assurance' towards more human approach as the significance and emphasis of human sciences has increased. Accordingly, the practical implications of this field and the resources channelled to it have been substantial (Dix et al., 1993; Nickerson and Landauer, 1997; Noyes, 2001; Preece et al. 2002).

In the 1980's, user perspective gained ground in the HCI research involving behavioural sciences in the field. In HCI, behavioural scientists have been interested in the psychological prerequisites for the usability of devices and their user interfaces, with a special focus on measurement of usability. This is called the psychology of usability (Sinkkonen et al., 2002). In the 1990's the focus of the research moved to context-aware technologies and the social sciences and cultural anthropology found their place in HCI research (Beyer and Holtzblatt, 1998). Both these approaches paved the way for the standardisation work of the human-centred design standards (ISO, 1998, 1999, 2000, 2008).

Following the different approaches in the design processes mentioned above, Kuutti (2001) characterizes the history of "the user" in HCI. According to this characterization, the user started out in the 1970's as a cog in a rational machine, became a source of error in the 1980's and then a social actor in the 1990's, and can be seen now as a consumer.

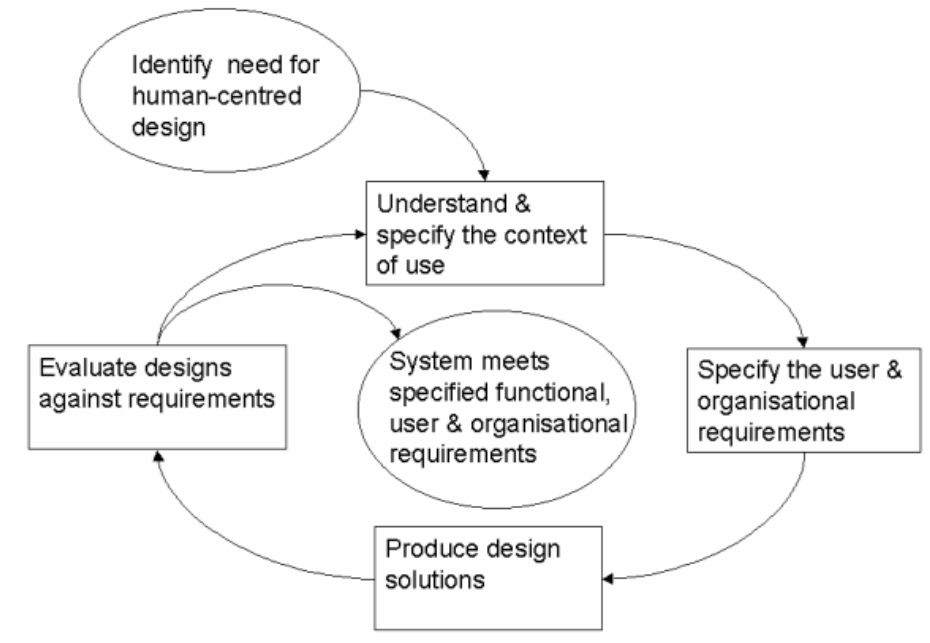


Figure 1. The interdependence of human-centred design activities (ISO, 1999, p. 6).

Human-centred design (HCD) (also known as UCD – user-centred design) is a commonly used design approach for HCI design. In the HCD approach, the user's roles and responsibilities are viewed as fundamental for ensuring the success of operations and are given priority in the design process (Noyes, 2001). HCD is based on international standards (ISO 1999, 1998, 2000). HCD-approach is usually defined as an iterative design cycle, where new design features are being evaluated, modified when needed and the new design further evaluated until finished (Figure 1). The main principle in HCI design is to follow this approach, which emphasizes the cognisance of the needs of the users in the design (ISO, 1999; Poulson et al., 1996; Vredenburg et al.; 2002). The design decisions are based on the collection of user needs and the definition of user requirements in the early phases of the design process (ISO, 1999), as well as on the clarification of these needs and requirements during the iterative product development process (Courage and Baxter, 2005). The iterative approach provides an opportunity for designs to be assessed and modified a number of times, resulting in better designs because the users have had a greater input to the design process (Noyes, 2001).

VTT[1] has applied human-centred design in its research projects and modified the ISO 13407:1999 approach to fit with software engineering design practices (Figure 2) (Kaasinen, 2005). This design process starts with defining target users, contexts of use and initial user requirements, and is followed by specifying design requirements and finally by actual design and implementation. It includes evaluation of concepts, visualisations and prototypes in an iterative manner.

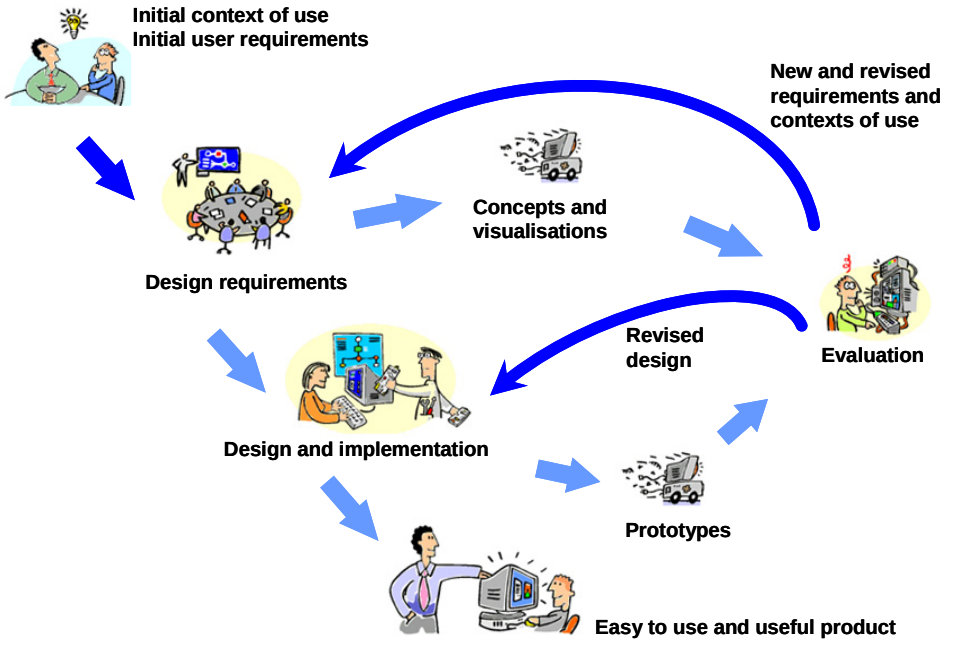


Figure 2. VTT's human-centred design approach (illustration VTT).

Human-centred design focuses specifically on making systems or applications easy to use (ISO, 1999). The design process is composed of a number of key activities (ISO, 1999; McClelland and Fulton Suri, 2005): understanding and specifying the context of use, understanding and specifying the user requirements in relation to the context of use, iteration of design solutions, and evaluating the solutions with the users against requirements. This means that "the specification should define the allocation of function: i.e., the division of system tasks into those performed by humans and those performed by technology" (ISO,

[1] For VTT, see http://www.vtt.fi.

1999, p. 7). User studies are tailored to meet the needs of each design case and include several techniques ranging from interviews and observations to scenarios, user tests, participatory prototyping and field studies. All of them focus on capturing data about the human-technology interaction in a specific usage situation.

The basic element of HCD, as well as the whole of HCI, has been *usability research* which has been grounded distinctly on technology and focused on developing solutions for the improvements of already existing concepts of technology. Usability has been recognized as one of the most important characteristics of systems and products and defined as the measure of the quality of use when interacting with a product or service. According to the international standard ISO 9241-11 Guidance on usability, usability is "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO, 1998, p. 2). Usability is also defined as a set of measures, design aims and practices for designers to ensure that a product will fulfil a specific set of user needs (Keinonen, 1998). Thus, standard usability paradigms tend to focus on the quality of the system rather than on the quality of the human-technology interaction (Noyes, 2001). Consequently, usability testing is an essential part of human-centred design (Dumas and Redish, 1993; ISO, 1998; Lindgaard, 1994; Mayhew, 1999: Nielsen, 1993; Nielsen and Mack, 1994; Rubin, 1994; Virzi, 1997; Wixon and Wilson, 1997).

Usability heuristics have served as the leading paradigm to guide the improvement and the evaluation of ease-of-use interaction. This has been exemplified in a number of publications on the topic, such as Adler and Winograd, 1992; Jordan, 1998; Jordan et al., 1996; Kirakowski, 2000; Nielsen, 1993; and Rubin, 1994, to name but a few. Usable systems should be easy to learn, efficient to use, not error-prone, and satisfactory in use (Nielsen, 1993). There are many ways of measuring usability but it is generally recognised that usability encompasses the ease in which the product or service can be used, its effectiveness in allowing the user to achieve her or his goals, and its likeability (Noyes, 2001). High usability has been said to bring many benefits for the user and possible other stakeholders of the product. According to the standard (ISO 1999, p. 2), systems with high usability are easier to understand and use, improve user satisfaction, reduce discomfort and stress, improve the productivity of users and the operational efficiency of organizations, improve product quality, appeal to the users and can provide a competitive advantage. The key word for a successful outcome of the design is iterative design in which the prototypes of different development levels

are evaluated with the help of end-users (Clement and van den Besselaar, 1993; Grudin and Pruitt, 2002; Nielsen, 1993) or together with them in participatory or co-design sessions (Muller, 2003; Schuler and Namioka, 1993). It is argued that when the end-users participate in the design from its very beginning, the product to be developed will satisfy the needs of the users both in a qualitative and functional manner. In short, the products will be satisfying to use when the usability problems can be minimized (McClelland and Fulton Suri, 2005).

Although usability is a good framework for accessing the suitability of a product for a predetermined purpose, it is not acceptable that the international standard (ISO, 1999) shrinks the design work to cover only the inspection of usability problems in the different phases of the product development cycle. Usability is only one factor that has an influence on the purchase and usage of a product; there are others beyond it. As the focus of technology development is shifting more and more from traditional desktop computing to ubiquitous computing applications (that are available everywhere and all the time) and ambient technology, it has been recognised that technology must be useful in the lives of those using it, and thus there are also other relevant attributes of human-technology interaction. In parallel with usability, people value many other quality attributes which the designer should take into account in her or his work (Cockton, 2004; Desmet 2003; Dillon, 2001; Klauser and Walker, 2007; Koohang, 2004; Norman, 2004; Schütte, 2005). For different user groups these quality attributes can have different weightings (Leikas and Lehtonen, 2007; Melenhorst, 2006; Leikas and Saariluoma, 2008a).

Luckily, along with increased understanding of the phenomena of human-computer interaction the understanding and weighting of the concept of usability itself is also changing (Carroll, 2004; Rosson and Carroll, 2002), although it is still dominating the design and decision-making process of future products. On one hand, people are becoming more and more skilful in the use of technology, and on the other, computers have proliferated vastly beyond the scope of tools and become a ubiquitous part of the daily life of many people. Thus, there is much debate about the exact meaning of usability. The importance of pleasure will without doubt increase in the future, as people will no longer tolerate using products that do not please them.

The human-centred design approach has been criticized not only for concentrating mainly on usability but also for lacking detail about the structuring of the design process (Bowhuis et al., 2008). Even while this approach is widely advocated, the full method seems to be generally too costly and time consuming to

implement as a standard practice. The criticism does not, however, mean that user involvement in design would be counter-productive. There is empirical evidence (Rauterberg, et al., 1995) that when end-users are involved early in the design process the design costs are significantly lower, and the development times shorter than without end-user involvement.

I have illustrated how the traditional human-centred design as a design approach does not really arise from the interest towards humans but actually from the interest towards technology. 'Human-centred' in this sense means that a human being, the user, is in focus only as a test object for the design and launch of a desired technology. Even in the concept design phase, user studies are carried out mostly in order to serve the purpose of the new technology. There have been attempts to change this practice to make it more human-centred with the introduction of the term *human-driven design*, where the starting point in the design really is the human being and her or his needs, goals and desires (Ikonen et al., 2007). Here, the desire to move human-technology interaction design beyond the traditional concept of usability (Green and Jordan, 2002; Jordan, 2000; Norman, 2002; Norman, 2004) is understood and the relationship between people and products more holistically addressed.

In human-oriented thinking the aim is in exploring new perspectives of the diversity of HTI research and development and focusing on the human being and the general characteristics which define her as a user. In this sense, for example, user psychology as a design discipline should be brought more in the design. This discipline stresses the cognisance of psychological goals, needs, limitations and preferences of people in the design (Saariluoma, 2004). While psychology of usability (Sinkkonen et al., 2002) emphasizes usability testing, user psychology strives to bring the central psychological conformities as part of the design process and as a basis for interaction design. Hence, user psychology focuses on HTI in the human being and the general characteristics which define her as a user.

As I have highlighted the necessity to consider other attributes besides usability in the design of human-technology interaction, I will study these attributes in the following. The list is not comprehensive, and different attributes have, of course, different weightings, depending on the case. Anyhow, the following introduction will give an idea of the diverseness of viewpoints that can be brought in the human-driven design.

The first concept worth studying is *user experience*. The ability to design for user experience became a focal issue in human-technology interaction design in the early 2000's (Hassenzahl, 2004; Forlizzi and Battarbee, 2004). User experi-

ence was introduced as a holistic term to describe the overall experience that a user has when using a product or a system (Battarbee, 2004; Cooper et al., 2007; Kuniavsky, 2003). It is seen as users' perceptions of human-technology interaction, which, in turn, is associated with several interrelated factors ranging from traditional usability to aesthetic, hedonic and affective aspects of technology use. In fact, there is no specifically defined common understanding of the explication of user experience. Most often the notion has been used as an attempt to extend the viewpoints of usability and human-centred design. User experience research leans on the understanding that the experience of even simple artefacts does not exist in a vacuum but is realized in a dynamic relationship with people, environments and objects (Buchenau and Fulton-Suri, 2000). The conception of user experience is thus broadened from traditional usability to concern different aspects of experiencing products or services, including physical, sensitive, cognitive and emotional relations (Kuniavsky, 2003). Hassenzahl and Tractinsky (2006) explain user experience as a consequence of three categories of factors: factors related to a user's internal state, the characteristics of the designed system, and the context within which the interaction occurs.

User experience as a research paradigm shifts the emphasis from functional features of HTI to the quality of interaction. Norman (2004) stresses the affective and emotional aspects of interaction, and in addition to this, McCarthy and Wright (2004) emphasize the meaning of culture in experience. Battarbee (2004), from her part, highlights the social nature of user experience, thus broadening user experience to cover not only the experience of a single person but also the conceptions and experiences of different user communities towards technology. This view brings a social aspect in terms of co-experience and shared experiences in the concept of user experience. Väänänen-Vainio-Mattila et al. (2009) sum up the key elements of user experience to include the feeling of flow in interaction, pleasurable and hedonic aspects of product usage, and multisensory interaction. In addition to these elements they introduce key elements for service user experience (SUX), which are trust and coherence of service interaction, social navigation and interaction, temporal experience with 'live' services, nonphysical interaction, and multiple interaction styles.

The emphasis of the approaches to user experience mentioned above is on people's experiences, feelings, (positive) emotions, perceptions and behaviours in the usage situation. These attempts to delineate user experience have been based either on cognitive science and task-related experimental analysis, or phenomenological approach and qualitative analysis (Swallow et al., 2006). Isomäki

(2009) proposes a more holistic theoretical framework for understanding user experience as a combination of various interrelated fundamental modes of being that are present in human-technology interaction. In this framework, while interacting with technologies, users experience the world through physical, organic, mental, social and cultural modes of being.

User experience design (or interaction design) aims at measuring and enriching the user experience (i.e. the product quality) (McCarthy and Wright 2004; Shedroff, 2001), focusing on the interactions between people and products or services, and the experience resulting from this interaction. In the sense of positive HTI it wishes to focus on "how to create outstanding quality experiences rather than merely preventing usability problems" (Hassenzahl and Tractinsky, 2006, p. 95). This is a natural trend in the design as a response to the need to deal with all kinds of interaction technologies in addition to computer technology. It reflects the broadening of focus from computers and work-related tasks to the usage of wide range of interactive technologies, bringing the user's overall and lived experience and natural interaction into the focus of the design (Hammel, 2004; McCarthy and Wright, 2004). For the design, an essential challenge is to understand factors that constitute and shape user experience of new technologies and smart environments. The concept of 'affordance' is seen as relevant in this connection. Norman (1988) describes it as action possibilities that are perceivable by the user in the user interface, and connected with plans, goals, past experiences and values of the user.

As can be seen from the discussion above, the concept of user experience is still rather ambiguous and thus elusive, lacking so far empirical research and therefore exact definition (Hassenzahl and Tractinsky, 2006). In any case, it deals with human-technology interaction in the usage situation, and from this point of view includes factors that influence the usage of products and services. These factors include, e.g., *user satisfaction* and *user acceptance* (Bouwhuis et al., 2008; Davis, 1989; Kaasinen, 2005, 2009; Venkatesh et al., 2003). Along with positive factors, user acceptance includes also the presumptions of negative factors in the human-technology interaction. These can be rejection, total abandonment, or partial non-acceptance of technology. Different technology acceptance models include elements of user attitudes and user experience towards technology as well as elements of different characteristics of people and the usage environment. The first models of user acceptance focused on the interaction between the user and the technology. The later models consider also the change

in people's acceptance of technology along with and due to the usage of products and services.

Other important factors besides user satisfaction and user acceptance are *easiness to learn* (intuitiveness), *transparency* (the ideal relationship between the user and a disappearing product), *user control* (users should be provided with appropriate feedback about system changes that will give them a feeling of being in control), and *enjoyability* (devices should be enjoyable, entertaining and engaging) (Nielsen, 1993; Rutkowski, 1982; Weiser and Brown, 1995; 1996). Jordan (2000) talks about pleasure as an important factor in human-factors design (see also Green and Jordan, 2002). In the context of products, pleasure can be defined as the emotional, hedonic and practical benefits associated with products. Jordan argues that instead of stressing usability in the design it should be guaranteed that products are a joy to own and use. *Pleasurability* is thus not simply a property of a product but of the interaction between a product and a person.

It has been noticed that although products have been designed according to HCI models and tested for high usability they do not necessarily become closely linked with people's lives on an emotional level (Dandavate et al., 1996; Jordan, 1996; Moggridge, 1999; Rijken and Mulder, 1996). However, *emotions* are an essential part of the emergence of user experience, and can be even more important than usability, as they create satisfaction and awareness of the product or brand (Dandavate et al., 1996; Desmet, 2003; Desmet and Hekkert, 2002; Hassenzahl, 2001; Holman, 1986; Montague, 1999; O'Connor, 1997; Schütte, 2005). Emotions are closely related to feelings, though feeling is often used in colloquial language to describe a broader concept than emotions (Oatley and Jenkings, 1996). Affect, also a close term to emotion, has mainly been used in older psychological literature (Tomkins, 1984). Emotions are also closely related to needs and motives; the quality attributes which a person tunes in to through emotions (Norman, 2004; Oatley and Jenkins, 1996; Saariluoma, 2004; Solomon, 1993). We value things and make decisions accordingly on the basis of our own emotions. Thereby, emotional design is an essential part of natural interaction design. Our emotional rationales affect our decision regarding our behaviour.

Yet another central quality attribute of a product and part of user experience is *aesthetics*. The research of the relation of aesthetics and HTI is still in the very beginning. However, we know already that the consumers are not so much interested in usability as they are in aesthetic pleasure (Bertelsen et al., 2004; Hassenzahl, 2004; Tractinsky et al., 2000). The quality attributes that are empha-

sized in aesthetics and beauty are sociality and communication of personal values to others. The image that the product would give about its owner is an important factor from the point of view of the purchase decision. The valuation of aesthetics is, to a great extent, dependent on trends and fashion, but also, what is considered beautiful and harmonic is determined culturally and is reflected differently in a multitude of different lifestyles. All in all, aesthetics and usability do not exclude each other, on the contrary, both of them should be included as valuable quality attributes of design.

I have showed that satisfactory human-technology interaction depends on many different factors, from accessibility to pleasure and from efficiency to felt experiences. Consequently, HTI as a research field is a multidisciplinary frame of reference with many different approaches (Carroll 2003; Helander et al., 1997; Jacko and Sears, 2003; Preece et al., 1994; Shneiderman, 1998). As the HTI research is multidisciplinary, there cannot be only one comprehensive approach to solve the problems and challenges of human-technology interaction. In the end, the question is about the point of view that we want to stress in the research: the technology-driven or the human-driven.

The technological perspective on human-technology interaction described above is necessary, of course, and there is no doubt that usability and user experience research are needed and have their place in the human-computer interaction research field. However, the design principles of human-centred design are built mainly to ensure the usefulness and ease of use of the developed product.

Therefore the main problem in the interaction design is still in the fact that the designers are mostly worried about how the users would be able to *use* the solutions they design. This concern has resulted in design practises where the main focus has been on the usability of the systems. The concepts ‘user needs’ and ‘user experience’ already in their verbal expression tell us that the focus of the activity is on technology which is used by ‘users’. (Actually, based on what is understood by ‘user experience’ the term should, in fact, be ‘use experience’.) Thereby these technology-based terms describe the usage of a specific product or service. They do not actually describe the reasons why to select specific products or services for use, i.e., they do not describe social or psychological needs or motives of people who are associated with the selection and purchase of specific technology. In addition, usability and human-centred design typically place the emphasis on the first confrontation between the user and the system. As such, this orientation is unable to capture what happens during the course of time when products are gradually domesticated into everyday life (Kurvinen, 2003).

Actually, none of the design attributes introduced above can bring solutions to the problem of how to develop products and services that would be desired by consumers by reasons of their existence alone and not only because of their satisfactory usage. In other words, they do not bring forth any concepts and tools to design for practical life. I believe that the desire towards technology arises from the needs in people's everyday life. If this cannot be understood, we will never end up with satisfactory solutions in the design. If the starting point of the design is in technology instead of people's everyday life, and the understanding of life and the level of applied knowledge of human sciences is low in design practices, the design is likely to suffer from reliability problems.

The only possibility to truly understand the human-technology interaction is to bring knowledge of the diversity of users' everyday life and genuine needs in it in the product design (Abowd et al., 2002). Quite simply, this means that human-technology interaction design should be able to perceive, analyze and design technology through the knowledge of and for people's everyday life. I will address this issue in the following chapter.

2.5 New approaches in HTI design

There are some new design approaches that are targeted at having access to the users' perspective already in the very early phase of the product design. These approaches do not consider life as such, but interestingly, and from different perspectives, study the way to conceptualise the problem of designing for everyday life. Among these approaches are ethical design, worth-centred development, empathic design, inclusive design and design for pleasure. They all bring their share in understanding the design for life. *Ethical design* and *worth-centred development* consider values from different perspectives. The former is interested in ethical values and especially information (computer) ethics, that is, the field of applied ethics which deals with ethical problems that are created, transformed or exacerbated by computer technology. The latter is concerned with values for the user, practical and moral, in general as a subjective added value of the product. *Empathic design* calls for understanding of the user's experiences and feelings as the main design challenge. *Inclusive design* refers to the conception that all citizens should have access to technology and should be able to make effective use of it. Finally, *design for pleasure* highlights the importance of joy, in a broad sense, in owning and usage of different products. In the following, I will use a term *value-oriented design* to cover all these approaches.

In value-oriented design the design goals and decisions are based on the intended and desirable value (moral or non-moral) for the user. This is an essential contribution, as it introduces the key concepts in everyday life as the starting point for the design thinking. Values are essential in defining the goals that people have in their life and they are shaped by all the elements of form of life, also. In this sense many form of life elements are culminated and reflected in values, and through values they become visible both in our daily activity as well as in future plans that we make.

Value-oriented design can be viewed from many different viewpoints. It can be seen to express the relations between ICT and human values. In other words, it helps in finding out the kind of value HTI can bring to people. With it, one can also emphasize economic and business value from the point of view of product or service providers. The added value that a product or service brings to the user, i.e. the reason for using the product, can be attributed to its use as well. Moreover, it can be seen as incorporating human values to product development. Through incorporating human values to product design it is possible to enhance the desirability of the products and thus increase the value of the product also from the commercial point of view.

Value-based descriptions of users make it possible to gain information of different needs and hopes of people towards technology, and succeed thus in offering substantial information. This is not the case with different consumer models. Consumer models are useful for demographic descriptions of different user groups but they do not really tell about people's life and life values. They do not consider individuals as moral subjects whose acts are based on moral decisions, and they do not include questions of ethics or moral rights in relation to the developed technology (van den Hoven and Manders-Huits, 2008).

Value-oriented thinking is not a totally new approach to technology design. It has been promoted by Friedman, Kahn and Borning (Friedman and Kahn, 2003; Friedman et al., 2006) as well as Cockton (2004, 2005), although from slightly different viewpoints. They argue that HTI research has been incomplete, as it has not brought human values in the design. In the value-oriented views the user, the user's values, the context of use and the technology to be developed all together serve as cornerstones in the design (Cockton, 2005), in this particular order.

In the following, I will introduce the five different approaches to value-oriented design mentioned above in more detail. In all these approaches the attitude and the will of the designer towards the design activity play a much more

significant role in terms of the outcome of the design than does a mere mechanical compliance with certain design guidelines and rules. From the point of view of life they introduce perspectives which have been missing from the traditional human-technology interaction approaches and which should be welcomed. None of these approaches as such, however, succeeds in bringing a holistic approach to designing for life.

Therefore, we still miss generality and have to find even more versatile concepts for the basis of the design. Values, needs and interests alone do not define how technology should be connected to life, though they all make sense in this discourse. The crucial point is to find a more detailed description of life and to justify the role of technology in it (Saariluoma and Leikas, submitted).

2.5.1 Ethical design

I have claimed that the design of products and services for people is ultimately about designing technology which would support and enhance the quality of life, in other words to produce 'the good of man'. Here the main question concerns the interpretation of "good". What can be considered as good, from whose perspective and what kind of choices generate an increase of goodness? It has been claimed that as time passes and people change, so too do the ethical stances taken and views held. Thus, what is deemed to be ethically and morally unacceptable at one time may become perfectly natural at another, as in the case of robotics, for example, (Cerqui, 2002; Warwick and Cerqui, 2005). Cochrane (1997), for example, has sketched a scenario about future attitudes towards microsensors in his "Tips for the Time Traveller": "Just a small piece of silicon under the skin is all it would take for us to enjoy the freedom of no cards, passports, or keys. Put your hand out to the car door, computer terminal, the food you wish to purchase and you would be dealt with efficiently. Think about it: total freedom; no more plastic."

In any event, interpretation of goodness leads to discussions of moral rules and the rights and responsibilities of people. Thus, ethical issues cannot be left outside the scope of design. They may have significant consequences for human wellbeing, and will always be solved within the design decisions, either explicitly, knowing precisely what to do and why, or implicitly (Bowen, 2009). Unfortunately, the latter is the more typical approach in the design – representing also a choice of value as such – because it is not easy always to perceive ethical issues. However, the implicit inclusion of ethical questions may lead to negative

or even catastrophic solutions instead of good ones. Recent terrorist attacks where mobile phones have played critical roles serve as an example of this, clearly indicating the tightly woven role that ethical questions of mobile technology already have in our social and cultural being. In the Madrid bombings of 2004, mobile phones were used to trigger the bombs and then, subsequently, mobile phone records were used to trace the bombers themselves (Glotz et al., 2005). This raises questions concerning international crime control and anti-terrorism efforts related to mobile communication, as both the conduct of terror as well as efforts to safeguard people's lives are being affected by mobile communication. Who is gaining advantage of this and with what results?

A meaningful concept for justifying technology from a moral point of view is ethical design. In ICT research and development, ethical design is grounded on information (or "computer") ethics, the field of academic study which examines the actual and possible impacts of information and communication technologies upon important human values, such as life, health, psychological and physical wellbeing, happiness, abilities, peace, democracy, justice, opportunities, and so on. The overall goal is to advance and defend human values in light of the possible and actual impacts of ICT. (Bynum and Rogerson, 2004.)

Ethical design is interested in social and moral norms and rules and their implications for technology design. Every form of life has its own norms and rules, and some of these are moral ones. These rules constitute a set of directives about what one should and should not do as well as what one is allowed to do. These directives are influenced also by non-moral rules, such as what one can do, what is possible to do, what is impossible to do, and what can positively be done. Also, conditional rules, such as what happens if we act in a certain way, belong to our forms of life. In ethical human-technology interaction design we can examine these moral rules and assess our design decisions against these rules.

Ethical design means, first of all, conscious reflection of ethical values and choices in respect to design decisions. Secondly, it means reflection on the very design process and the choices of design methodologies. In addition, ethical design means what is ethically acceptable. Finally, ethical design must consider the issues of what is ethical, i.e. what constitutes the good of man.

In respect to ethical considerations of design decisions, there are two aspects to consider. Firstly, it should be examined what the prevailing moral rules and norms of the users are and what kind of impacts they have on the design decisions. As an example, we can think about data protection issues: there are users who, for example when using the Internet, do not follow the principle of doing

no harm to others and may violate the privacy of other users. This is why protection of user data has to be guaranteed in, e.g., network services. If we want the design work to support the forms of life of the target users, we should acknowledge that norms, rules and values of the users may determine the goals of the design.

Secondly, we should be aware that also the moral norms of the designers themselves may greatly influence the design. The developer or designer does not work in a vacuum, and the values in her or his life will also influence the design decisions. When this is fully acknowledged, it is possible to take into account the importance of values as an integral part of the design and exploit value-oriented methodologies for the design as well.

Cairns and Thimbleby (2003) have studied ethical aspects in realising human-technology interaction design. They argue that the goal for design should be in creating a good human-technology interaction and the good of man in this sense. From this point of view, there are more important attributes for the design than usability. Hence, the designer should take the ethical stand and consider whether the goal of the design is to eliminate usability problems, or whether it should promote goodness in a broader sense. As an example, when designing for older adults we can ask, e.g., what can be achieved if we enlarge the font size of an application: Can we facilitate reading of older adults with it: who will benefit from it, and who might be harmed by it?

Cairns and Thimbleby (2003) argue that ethics is an appropriate framework for the study of good user interfaces. They believe that realising HTI (or HCI as they put it) can be assessed in the light of moral theories. They have gathered examples of the correspondences of ethical theories and HTI (Table 3). With the help of these examples a designer should be able to assess whether (s)he has made the design decisions, for example, only in order to do her or his duty or maybe to enhance the overall benefit of people. The duties that the designer might be confronted with may restrict the number of different design alternatives regardless of the possible total benefit for the society and its citizens. This way of thinking supports the idea of deontology (Kantian ethics) (Kant, 1949). On the other hand, if the designer feels that the most important criteria for her or his work is the usefulness of its outcome, (s)he is committed to the model that promotes utilitarianism and consequentialism.

If the goal of HTI design is in designing a good interaction, it is essential to deliberate what we mean by ‘good’ in this respect. Is it designing efficient user interfaces or enhancing the quality of life for people? Is it ‘good’ from the point

of view of the designer, the users, the employer or the customer? If good as such cannot be operationalised, it is difficult to assess the value of the design work. This is why bringing ethics in the practises of HTI can be valuable. Cairns and Thimbleby (2003) argue that examining HTI in the light of ethics may bring forth essential questions which would in any case be solved by the designers, implicitly or explicitly. For instance, there are different supplementary operations models inside HTI, out of which the designer should be able to choose the most suitable one. This choice is guided by many questions. For example, can the design be accomplished without sufficiently studying user motivations? Or how can aspects of HTI be studied without proper user interface specifications? Accordingly, how can HTI design be carried out without a proper empirical study? Then again, how would empirical study be competent without a formal description of the application and its users? On the other hand, if we consider all user groups and their diversity, how could empirical studies be enough unless they are carried out in a broad scale?

Table 3. Examples of correspondences between some ethical theories and HTI research (modified from Cairns and Thimbleby 2003).

Ethics	**Human-technology interaction research (HTI)**
Deontology; the value is in the activity itself, not in the consequences of it. There are universal norms, defined by normative ethics, that people should follow.	Leaning on standards (e.g., ISO, NASA).
Situation ethics (ethical particularlism); morality of a subject depends on its context. Thus ethical principles should be adapted in practice through considering the linkage between the subject and its context.	Depends on user's task, motivation, etc.
Ethical monism; highlights that there are certain values and norms which are principal compared to others.	The emphasis is on designing usability.
Utilitarianism; the best solution is the one which produces the greatest amount of happiness to the greatest amount of people.	Emphasises the cost-effectiveness of design.
Consequentialism; permitting an act is based on the consequences of its accomplishment when compared to the potential outcomes of other possible alternatives of actions.	Usability metrics; the emphasis is on measuring usability.
Virtue ethics; life should consist of different constituent functions in such a way that there is nothing too much or too little.	The designer is right.
Hedonism; man ultimately strives for – and should strive for – pleasure and enjoyment.	The emphasis is on promoting user enjoyment.

Technology as such has for long been seen as value neutral. It has been associated only to facts, whereas ethics has to do with normative and inexact issues. Now this way of thinking is moving aside. Technology is not considered outside ethics, on the contrary, each technical device has its ethical dimensions (Pieper, 1997; Stahl, 2008; Widdershoven, 1998). According to van den Hoven (2005),

ICT technology has become a constitutive technology. It partly constitutes the things to which it is applied. It shapes our practices, institutions, and discourses in important ways. What health care, public administration, politics, education, science, transport and logistics will look like within twenty years from now will in important ways be determined by the ICT applications we decide to use in these domains. ICT will also shape the way we experience ourselves and others.

ICT has brought many useful things to the everyday life of people but along with its positive effects its usage may lead to many risks, also, in respect to information complexity, security, and privacy, among others. For example, ICT applications have provoked ethical discussion in such areas as online medical consultations and home monitoring of older people. Ethical questions related to these concern, for example, confidentiality, data protection, civil liability for medical malpractice, prevention of harm, informed consent and patient confidentiality. The development of ICT can also be menaced by the faith in the omnipotence of technology. With the use of ICT technology it is possible to instantly influence the whole world from one's home computer.

Von Wright (1981/2007) deliberates on the ethics of technology in respect to real humanism, human being and sociality in focus. He stresses the importance of human solidarity as opposed to self-centredness caused by technical development, which has deeply influenced human life conditions and life style and lead to unification of ideals.

Von Wright speaks about technological imperative meaning, stating that the development of technology has autonomy, i.e., its own logic, in which individual actions or hopes are of secondary value. He takes as an example computers, the efficiency of which has put aside many earlier production methods. Changes in the way of producing goods and services have lead to changes in consuming patterns and to a creation of technological life style. Technological cultures have set aside traditional values and the role of values as legitimating entities for our actions. Consequently, a justification crisis has emerged, as much of the new technology is in want of legitimating values. Von Wright argues that the question of the justification of technology has not been presented clearly enough, and as a consequence our ultimate goals are becoming unclear. If technology is being misused it is due to the fact that we have lost the very essence that once justified and guided human action. (Von Wright, 1981/2007.)

An important ethical question in relation to research methodology and product development processes is, in a sense, the superficiality of user studies. The difficulty with many product development projects is that often, in the prototyping

phase, it is possible that only a very limited number of users are involved in the evaluation of the prototype. The budget of the development projects is often too restricted and can cover mainly the technical development work, leaving out profound user evaluations, such as long term user studies. In addition, the increasing speed of the development cycle brings additional challenges to the design, such as how to deliver the vital information about the users, their values and expectations in such a way that it would be available in every phase of the design process and for every designer.

During a short term development process of a product or service it is possible to assess the influence of technology on, for example, users' health, physical capacity, or independent living. Also, acceptability of the product can be assessed with different measurements. Accordingly, usability and efficiency can be assessed in different usability tests. But it is not possible, within short term user studies, to evaluate the influence of the product or service on people's life and on the actual quality of everyday life.

To conclude, ethical design is one aspect to design for life, as it considers values in life, but it does not holistically consider the contents of life. For example, ethical design can tell us that it is good in rural areas to develop telemedicine for older people, but it does not tell what kind of usage culture should be built around this technology. Thus, it cannot provide such factual information on life that would in general support the design of technology for people's lives.

2.5.2 Value sensitive design

Friedman, Kahn and Borning (Friedman and Kahn, 2003; Friedman et al., 2006) have discussed the significance of moral values in technology design. Their approach, Value sensitive design (VSD), brings forth moral issues in product design. According to VSD, the developer includes human values in the design, either intentionally or unconsciously, through the design methods as well as the design decisions. VSD emphasizes ethicality as a starting point for the design, and highlights such moral values and ethical principles as privacy, non-discrimination, autonomy and control. These attributes are typical to computer ethics, and arise from and are focused on the usage situations of technology.

Value sensitive design is thus one way of considering ethics in the design, as it aims at making moral values part of technological design, research, development, and production. It works with the assumption that human values and norms, our ethics for short, can be imparted to the things we make and use. This

approach emerged in the 1990's as an approach to the design of information and computer systems that accounts for human values in a principled and comprehensive manner throughout the design process. While emphasizing the moral perspective, value sensitive design also accounts for usability, conventions (e.g., standardization of technical protocols), and personal predilections (e.g., colour preferences within a graphical interface).

The moral values emphasized by VSD are shown in Table 4.

Table 4. The moral values emphasized by VSD (Friedman et al., 2006).

Human Welfare:	Refers to people's physical, material, and psychological well-being.
Ownership and property:	Refers to a right to possess an object (or information), use it, manage it, derive income from it, and bequeath it.
Privacy:	Refers to a claim, an entitlement, or a right of an individual to determine what information about himself or herself can be communicated to others.
Freedom from Bias:	Refers to systematic unfairness perpetrated on individuals or groups, including pre-existing social bias, technical bias, and emergent social bias.
Universal Usability:	Refers to making all people successful users of information technology.
Trust:	Refers to expectations that exist between people who can experience good will, extend good will toward others, feel vulnerable, and experience betrayal.
Autonomy:	Refers to people's ability to decide, plan, and act in ways that they believe will help them to achieve their goals.
Informed Consent:	Refers to garnering people's agreement, encompassing criteria of disclosure and comprehension (for "informed") and voluntariness, competence, and agreement (for "consent").
Accountability:	Refers to the properties that ensure that the actions of a person, people, or institution may be traced uniquely to that person, people, or institution.
Courtesy:	Refers to treating people with politeness and consideration.
Identity:	Refers to people's understanding of who they are over time, embracing both continuity and discontinuity over time.
Calmness:	Refers to a peaceful and composed psychological state.
Environmental sustainability:	Refers to sustaining ecosystems such that they meet the needs of the present without compromising future generations.

Value sensitive design considers thus ethics from the same point of view as traditional human-technology interaction approaches. This approach too is focused on the development process and usage situations of technical systems and devices. Thus, it does not give a broader insight to the realisation of the good in everyday life. However, despite its somewhat narrow perspective the approach is worth studying.

Value sensitive design includes a methodology that involves conceptual, empirical, and technical investigations (Friedman et al., 2006). Conceptual investigations involve philosophically informed analyses of the central issues of the case at hand. These issues include such questions as how values are supported or diminished by particular technological designs, who is affected, and how should competing values (e.g., access vs. privacy, or security vs. trust) be considered in the design, implementation, and use of information systems. Empirical investigations involve social-scientific research on the understandings, contexts and experiences of the target user groups of the technological designs. They focus on the human response to the technical artefact, and on the social context in which the technology is situated. Technical investigations focus on the design and performance of the technology itself, involving both retrospective analyses of existing technologies and the design of new technical mechanisms and systems. Their aim is to identify and develop technical mechanisms and designs that can support values.

In this methodology, the conceptual, empirical, and technical investigations are employed iteratively such that the results of one type are integrated with those of the others, which, in turn, influence yet additional investigations of the earlier types. The methodology is concerned with both direct and indirect stakeholders. Direct stakeholders refer to parties who interact directly with the computer system or its output. Indirect stakeholders refer to all other parties who are otherwise affected by the use of the system. Friedman et al. give an example of online court record systems, which impact not only the direct stakeholders, such as lawyers, judges, and journalists who access the court records, but an especially important group of indirect stakeholders: the people documented in the court records.

Value sensitive design is a valuable approach to practising computer ethics in the design and can be seen significant in that sense. From the point of view of people's goals in life it does not, however, give any insight to the design. Again, we can see that we cannot infer how people should, on the grounds of ethical values, organise themselves to use a good service. The facts cannot be derived from values and for this reason value concepts provide us with one aspect of life only.

2.5.3 Worth-centred development

One of the most promising value-oriented approaches of human-technology interaction is worth-centred development which Cockton (2004, 2005, 2006, 2008) has introduced. In this approach the emphasis of the design is in the interaction outcomes, the 'worths' that people consider in relation to products and services. 'Worths' as values cover much broader contents than the moral values of human welfare and justice. In Cockton's view, the design decisions are based on the intended or practical value experienced by the users. Of course, there are also other 'worths' than practical ones to the users. For example, playing a game can represent a significant worth to both young and older persons.

Cockton uses the expression worth-centred development (WCD) to separate the approach from value sensitive design, which emphasizes moral values. In this approach, 'worth' is a broader notion than 'value'. Worth-centred development has a more open genesis, starting with the worthwhile, that is, whatever some people somewhere value, individually or collectively, irrespective of ethics, wisdom, style, taste, etiquette or the approval of others. According to this approach, the design should consider users' values, whether they are moral or non-moral, in other words independent from moral responsibilities and imperatives. This approach emphasizes that the focus of the design should be in the things that are 'worthwhile' for the user, from an individual or communal point of view, and irrespective of ethical norms, trends, fashion, etiquette, or people's approval in general. In this sense, worth-centred development emphasises much more practical 'value' than does morally focused value sensitive design.

The arguments behind the word 'worth' are two very confusable senses of the word 'value' in the English language. In British English, when someone talks about creating (nameless) value (i.e., something worthwhile), s(he) is not talking about values (something to believe in). The plural term can be used in expressions such as 'human values', e.g., before giving a list of human values with ethical and moral import. The other meaning of value is always encountered in the singular as an uncountable noun in British English. (Cockton, 2006.)

Thus, in value-oriented design we should talk about things of value (not values). Things of value are worthwhile, and thus they are things of 'worth'. According to Cockton (2006), worth-centred development focuses development on the worthwhile, that is, "things that will be values, as manifested in people's motivation, individually or collectively, to invest one or more of time, money, energy and commitment" (Cockton, 2006, p. 168). 'Worth' as a word, expresses

the broad intention of value-centred design and helps avoiding associations with Value Sensitive Design and commercial product development. It indicates people's motivations, especially 'needs' and 'wants', as well as product motivators, such as 'quality'.

An example of worth-centred development is Ilkone i800 device launched in 2004 by the Ilkone Mobile Telecommunications of the United Arab Emirates. The device claims to be the first fully Islamic mobile phone. The phone has many features that can be found helpful by many Muslims. "The GSM-standard phone includes the full text of the Qur'an in Arabic with an English translation, an automatic prayer call with full audio reproduction as well as a silence mode, a prayer alarm before and after the prayer call, automatic direction finding for Mecca directions, a Ramadan calendar and a Hijri calendar converter. The mobile "adds value to the user's self being and inner feelings rather than being just a simple communication tool. It is specially designed to serve Muslims all across the world to address their needs, and add value to their spiritual self being". (www.dinarstandard.com.)

Cockton's idea of 'worth' is not unique as such, although others have not expressed it using this particular term. In line with Cockton (2006), also Sponselee et al. (2008), for example, believe that personal needs determine the added value of the technology and its usefulness. They claim that people who, e.g., need support for independent living are more inclined than those who are not yet in need for support to use a new technology. Sponselee et al. argue that by designing technology based on the values and the needs to satisfy these values, also the usefulness of the technology should increase, with increased technology usage as a result (Sponselee et al., 2008).

WCD is not a methodology and thus does not include fixed methods in product design. It starts from connecting people and design sketches. So called 'worth'maps' (Cockton, 2008) describe the relationships between human values and different design possibilities. Worth-centred development principles direct the design process. The approach emphasizes six principles in the design. The first one, commitment, commits the designer to including certain values in the design outcome. The second one, receptiveness, assumes that the designer is sensitive in understanding the values of the users, makes them concrete and seeks support for them from different research and user studies. The third principle, expressiveness, sets these concrete values out in the design with the help of different elements of worth-maps. The fourth principle, inclusiveness, stresses the participation of all stakeholder groups in the discussion of essential design

outcomes and user experiences. According to the fifth principle, credibility, the design decisions should be fully justified, realistic and feasible. The sixth and last principle, improvability, stresses the significance of measurement and adaptability. In case the interaction between the users and technology does not work, it is possible to return to the examination and explaining of values and seek for support to the improvement decisions from alternative design elements.

According to Cockton, understanding 'worth' requires examination of discourses. "It is with discourses that all human value is created, and that all human values are 'inscribed'. Discourses can focus on the individual or the collective. For many collective discourses, there is a corresponding individual discourse: faith and spirituality, culture and identity, community and belonging, and society and esteem." (Cockton, 2006, p. 169.) In this sense it is interesting to examine 'worth' from both individual and collective perspectives.

From the point of view of *individual worth*, identity, belonging and growth are all important aspects as they belong to our psychological well-being and will all endure throughout an individual's life. In addition to these, according to Cockton (2006), transient pleasure and comfort can also be worthwhile, and so is an individual's current physical and mental health. In HTI research, interactive artefacts for this kind of value are gaining more and more importance. Thus, keeping individual worth as a starting point, worth-centred development stresses *volition* in interaction design. It wishes to shift the emphasis in interaction design from cognition (as human-work interaction) and more recently emotion (as in human-leisure interaction), to volition. When volition is in focus, the starting point for the design is not 'user goals' or 'objects' but human motivation.

Collective worth can be seen, for example, as commercial worth for companies. It can also be political worth in the public sector. Cockton (2006) argues that too often 'goals' and 'objects' in human-technology interaction research and development are not grounded in individual motivation, but rather to 'goals' and 'objects' relevant to collective worth.

Human motivation plays the most important role in worth-centred development when considering people's wants, needs and value or worth. While 'quality' is easily perceived as being 'within' the product, 'needs' and 'wants' lie within people. In worth-centred thinking, a product's quality as such is essentially its ability to meet users' wants and needs. Poor quality can reduce 'worth', but as this is always relative to wants and needs, it is not necessary to consider quality alongside wants and needs. 'Product quality' should be regarded at best as a surrogate for users' wants and needs. For example, the most important indi-

vidual product qualities for older people are reliability, ease-of-learning, ease-of-use, privacy, and safety (Leikas and Saariluoma, 2008a). At worst, it becomes "a belief in magic that alienates actual human motivators from product attributes, which are mistakenly attributed with intrinsic qualities of universal value; there are no people in such accounts of product quality" (Cockton, 2006, p. 169).

'Worths' as values cover much broader contents than the moral values of human welfare and justice. However, it should be emphasized that, when considering the contents of 'worths' of older people in the design, it is important to incorporate also the principles of ethics in the discussion. Many elderly people tend to be vulnerable and less powerful than the target groups of most commercial products, and thus consideration of ethical principles is also needed in the design, in order to make acceptable products for that group of people (Rauhala, 2007).

Taking 'worth' as a notion for design thinking is an advanced idea in human-technology interaction design. This notion is a clearly important concept in justifying technologies as it calls for improved fit of solutions with people's needs and wants, as well as strives for guaranteeing desirable products, services and applications. Cockton's approach is a conceivable one for the design thinking. We can assess the 'worth' of technologies and services in the context of everyday life. Everyday life justifies a technology. If a technology can give added value to users' lives, it is worth something and this is why 'worth' must always be assessed on the ground of everyday life. However, if we look at, only on intuitive grounds, what everyday life is, as the case is often in the discourse on HTI today, we cannot decide on scientific grounds how technologies can be related to life. This is why we have to have an articulated conceptual system with advanced basic concepts to describe life.

Worth-centred development gives a measure of the added value of technology. It concentrates on introducing the added value of the product to the user. It does not, however, problematisize life and does not take life as a systematic research theme. When concentrating only on values we might miss the constraints in people's life that inhibit the usage of technology no matter how well it is positioned to fulfil people's values. There are always different preconditions in life that create both opportunities and limits for the usage of technology. These might have nothing to do with people's values, but play a significant role in the adoption of technology. One approach to considering these preconditions in the design is inclusive design which I will discuss in the following chapter.

2.5.4 Inclusive design and gerontechnology

A fundamental prerequisite for using products and services is *accessibility*. The understanding of accessibility and user needs is emphasized in the inclusive design principle (also known as eInclusion, digital inclusion, design-for-all (DfA), accessibility and universal design) which is said to promote socially sustainable development (Clarkson et al., 2003; EDeAN, 2009; Macdonald et al, 2008; Newell et al., 2003). This design principle is concerned with designing mainstream products, environments, and services in a way that would make them accessible to and usable by as many people as reasonably possible and by an as diverse group of users as possible, in a wide variety of situations, and to the greatest extent possible without the need for special adaptation or specialised design. Accessibility in this context is related to the barriers that might inhibit full participation in the society by all citizens. These barriers can be physical, social or economical. (Dickinson and Dewsbury, 2006; Whitney and Keith, 2006). The high speed of the development of ICT technology poses new problems on how to incorporate inclusive design in the development process.

Inclusive design brings legislative pressures for the development of systems which are accessible to older and disabled people. The 1990 Americans with Disabilities Act (ADA) asserts the individual's right to use products and services on an equal access basis. In 1995, the United Kingdom implemented the Disability Discrimination Act (DDA) to a similar effect. European governments have also recognised that enabling legislation for combating discrimination is necessary for the promotion of independent living, extending quality of life and promoting the concept of participation in the "information society". (Zajicek, 2005, p. 153; Government offices of Sweden, 2009). Generally, this approach is justified, because not only does it recognise the needs of older people but also increases the potential market. However, design-for-all-solutions cannot always be the best ones for the ageing population. In many cases solutions for older adults need to be customisable and adaptive.

Inclusive Design can be seen as a value-oriented design approach, although the added value is strictly focused on accessibility. The approach has been criticized because of the fact that it seems to imply that a well-designed product is suitable for everyone (Bowhuis et al., 2008), and thus does not address design for different types of people. As such it has very little applicability in design that considers all elements of life.

Gerontechnology is a multidisciplinary and interdisciplinary research and development field that benefits from and supports inclusive design research. It is not a novel approach any more (established in the 1990s), but has become an outstanding one in customizing technology to individual needs of older people. It combines the sciences underpinning ageing (gerontology) and technology to achieve optimal technical living and working environments for ageing and aged people (Bouma, 2008; Bouma et al., 2008; Fozard and Kearns, 2008). In fact, gerontechnology approach addresses all technology that is useful for daily activities of all phases of the human life span, provided that it is targeted at a high quality of life of older persons (Bronswijk et al., 2009). Gerontechnology aims to provide a good life with the help of technology up to a very high age and includes assistive technologies and the support of care for individuals in their dwellings (Bronswijk, 2006; Bronswijk et al., 2002; 2008; 2009). Gerontechnology research relies on laboratory based experimental studies of the ageing process and of technology use, as well as field-based studies that attempt to implement technological solutions to mitigate age-related decline in abilities (Charness and Jastrzembski, 2009). According to Bronswijk et al. (2009) gerontechnology recognizes four goals of technological intervention in different domains of human daily activities. These are (i) enrichment and satisfaction (attaining the highest quality of life), (ii) prevention and engagement (delaying or preventing development-associated physiological and behavioural changes that restrict human functioning), (iii) compensation and substitution (in strength, perceptual-motor functioning or cognition), and (iv) care support and care organization.

2.5.5 Empathic design

A new approach to user experience research is empathic design (Koskinen, 2003), which originated from industrial design. It aims at gaining an emphatic understanding of the future users of a specific product. In this approach, developed as an alternative for marketing research, empathy is seen as an imaginative projection into another person's situation, representing an attempt to capture its emotional and motivational qualities. The aim in emphatic design is to look for design opportunities and ideas as well as develop a holistic understanding of the users. The focus is in understanding of how the user sees, experiences and feels an object in the situation in which s(he) uses it.

The focus is in the usage situations of products and services. The design is interested in subjective phenomena such as motivations, emotions, mental models,

values, priorities, preferences and inner conflicts, and empathy is the intuitive ability to identify these other people's inner states based upon observation of the outward expressions and behaviour of people. Empathic design is not interested merely in whether people can use a specific device, but whether they will have fun with it and want to make it part of their life (Fulton Suri, 2003).

Emphatic design is targeted at the fuzzy front end, i.e. the early phases of product development, when a range of design options are still open. The research methods provide designers access to how users experience their material surroundings and the people in it, including themselves as key characters of their everyday lives (Koskinen, 2003). According to Sanders and Dandavate (1999), in empathic design the understanding of users' needs requires exploring simultaneously what people do, what they say and what they make. The methods for the design, such as interviews, visual and verbal storytelling, role-playing, and self-documentation packages (probes) are visual and tactile, deliberately low-tech, interpretive, playful and fun. They are meant to help the designer to choose between hunches and concepts in the early design phase. They produce an understanding of the user by building an interpretation of the data (Koskinen, 2003).

Although empathic design considers users from a fresh standpoint, it does not include any extensive concept for a systematical analysis of life. It does not provide a systematic and objective way to conceptualise life.

2.5.6 The design for pleasure

As emotions have a significant role in determining our relationship with the surrounding environment, studying the emotional value of devices and artefacts is becoming to be more and more important in the design (Jordan, 2000; Bonapase, 2002). One approach to a more holistic design is introduced by Jordan (2000) in his framework of pleasures. The same way as Cockton (2004, 2005, 2006, 2008), also Jordan seeks for a design approach that would go beyond usability, beyond seeing products merely as tools and people as components of the human-technology system.

Jordan introduces a three-layer model for product requirements, where the first factor is functionality, followed by usability, and finally the last one is pleasure. Jordan argues that pleasure can be thought of both as the elimination of pain and also as the provision of positive, joyful feelings. He argues that products can bring us different kinds of pleasure. For Jordan, pleasure is not a dimen-

sion of usability, but an aspect of product experience and product evaluation that goes beyond usability.

Jordan's framework is based on Tiger's (1992/2000) model of four conceptually distinct types of pleasure – physical, social, psychological and ideological. According to Jordan, each of these components might be relevant in the context of products. Jordan's dimensions of pleasure are

- physio-pleasure
- socio-pleasure
- psycho-pleasure
- ideo-pleasure.

Physio-pleasure is derived from the sensory organs. It is related to touching, tasting, and smelling products as well as feelings of sensual pleasure. In human-technology interaction it would cover, for example, touching and holding products. This can be seen important in many products, such as remote controls, mice, keyboards, electric toothbrushes and shavers, etc.

Social-pleasure is derived from relationships with other people: family, friends, colleagues, and the community and society as a whole. Such issues as social and economic status and image have their role here. In the human-technology interaction social pleasure refers to social relations and communication enabled by the product. These products bring people together and provide topics for discussion. These kinds of products can be, e.g., chatting systems or barbecue grilling systems. Also there can be products that are symbols of interaction and belonging. Suitable examples of these are an engagement ring and a special Finnish Rukka jacket for golfers with a handicap less than ten. Products that would enhance social or economical status, such as home theatres and fancy cars belong to this group, also.

Psycho-pleasure is connected to people's cognitive and emotional reactions. In human-technology interaction this would mean cognitive demands of using a product and emotional reactions to success and errors when using a specific product. Psycho-pleasure is achieved when products assist users in accomplishing different tasks. When looking at the human-technology interaction point of view, this dimension seems to be closely associated with the traditional usability as a product property.

Ideo-pleasure refers to the values that products and their use represent. These may be related to, for instance, ecological awareness and the need to use biodegradable materials, but may just as well be aesthetic in nature, as for example

appreciation of arts is. In the human-technology interaction this would mean, for example, carrying an haute couture lap top computer made of re-usable materials.

When looking at this division above it seems that people create meanings to products of their everyday life, following the same areas that their forms of life are composed of. In a sense, the preconditions of our forms of life, the biological, psychological and socio-cultural aspects, can thus be seen also in our relations to products and technology.

Jordan's classification comes rather close to the classification of preconditions of form of life introduced in this book. Physio-pleasure relates to biological and psycho-pleasure to psychological preconditions of forms of life. Socio-pleasure in turn relates to socio-cultural preconditions of a form of life, whereas ideo-pleasure can be seen in relation to values, norms and rules in forms of life. However, there is no suggestion that all products should provide all four types of pleasure. Similarly, there are also pleasures that cannot be classified in terms of under which dimension they would belong to. Also, the four-pleasure framework is not intended to give an insight into why people experience pleasure in different contexts. Jordan's classification is meant to be studied only in the creation of different product design concepts, and does not include people's life as a whole as a starting point for the product design. However, people's values and lifestyles are considered in the design. Jordan stresses the need to quantify product pleasure in a way that corresponds to the way traditional behavioural usability has been quantified. He stresses the need to raise the importance of pleasure in the definition of product specifications and the importance to identify this benefit in the first place.

Jordan's aim at enhancing joy and pleasure in people's life through the development of pleasurable products is worth consideration. However, life and emotions do not only include pleasure but also many other values, goals and feelings. Thus the sector that Jordan addresses is quite narrow from the perspective of life, although worth supporting.

Promoting joy and pleasure with the usage of different artefacts can be seen as an integral part of the quality of life. This demand can be viewed at least from two different angles. Firstly, we can experience joy directly when using a pleasurable product. An example of this can be an alarm clock which starts to simulate sunrise when it is the time to wake a person, offering thus a smooth way to face another morning again, and can include even a birdsong when desired. Secondly, technology can bring us joy indirectly in the form of, e.g., improved social networks, better health and well being, or better access to information and

services. For example, a hearing device can bring joy to people as it facilitates better communication with other people. A pleasurable product can also be a pen-like device for injecting insulin. It is designed to look like a cool pen and can be carried in a small handbag or clipped into a jacket pocket. It does not carry any negative connotations nor is it socially labelling.

A product can also be tempting because of its looks. This is of course natural in relation to clothes, but also a nice-looking ICT appliance can as such entice a person to buy and use it. If a device is aesthetically valuable to a person, it will bring pleasure because of its design alone. An example of this can be, for example, a small iPod player with the size of a postage stamp, or a robot seal with a white hairy fur and long fluttering eyelashes.

Then again, if a device looks ugly and has a stigmatisation of an "old person", it will most probably not be used no matter how efficiently it would serve the purpose that it is designed for (Leikas et al., 1998). An example of bad design is a safety alarm button of a security system, designed to be worn around the neck. It has been noticed that this button sends unnecessary alarm messages by itself to a service centre. The reason for this is that old ladies have placed the button, contrary to the instructions, under their blouse, where the button can be accidentally pressed against the body and, thus by mistake an alarm message is given. The reason for hiding the device under the clothes is its ugly appearance. This is due to bad design, which does not take into account the wants of old ladies. Had the designer taken into account older ladies' desire for aesthetics, i.e. that of dressing nicely, the button would look different and thus be more readily accepted.

2.6 Conclusions: a need for a holistic approach

The traditions of human-technology interaction design do not systematically thematisize the analysis of life. Therefore it is essential to pay more attention to this grey area in controlled design process. We cannot design products and services for life unless we have sufficient conceptual systems to investigate the essences of life.

Nevertheless, all the discussed approaches provide us with important ideas concerning the analysis of life. However, they do not describe holistically problems of life. They lack concepts which would include some essential aspects of human life. Therefore, the perspectives they open up to life are too narrow though valuable within their presuppositions.

Consequently, in this book I shall investigate how we could develop such concepts, how we could use them and what does that mean in the practical design. First, in the next chapter, I will introduce traditional concepts to capture aspects of life. After that I will move on to a more analytical level in respect to the concept of life and introduce the notion ‘form of life’ as a conceptual tool for designing human-technology interaction.

3. Towards designing for life

3.1 From the demand of competence towards the design for life

I don't want to control my DVD – I want to watch a movie!

We don't just use technology in our everyday life – we operate, cope and live with it. ICT technology is deeply embedded in our everyday experience. We, ordinary people in the Western world, are used to electronic mail, mobile phone text messaging and Internet chat, and have become blasé with digital TV's and remote controls. Digital cameras, navigation systems, and home security systems are all part of our everyday life already, and we couldn't imagine living without washing machines, dishwashers, cookers or microwave ovens anymore.

Because technology is an essential part of our social as well as private life, in addition to the quality attributes presented in the previous chapter, there are naturally many other factors that strongly influence and determine our sympathies or antipathies towards technology. We as people have values, attitudes, hopes, dreams, aspirations and fears, ideals and intentions, and their impact can also be found in our relation to what we do with technology (McCarthy and Wright, 2004). Also, the benefits that we imagine gaining from the usage of technology (Cockton, 2004, 2005) contribute to our interest towards products and services. In addition, there are certain limits and restrictions in life which arise, for example, from our biology and contribute fundamentally on the usage and adoption of technology. Ultimately, all these factors have an influence on whether we really want to solve our everyday problems with technology in the first place, and whether we in general want to use products and services to do something.

As presented earlier, the traditional HCI research has concentrated mainly on the issues around the usage of technology. The main interest area has been in studying how people could manage and learn to use devices and services and how the services could be developed in a way that their use could be as intuitive as possible. Thus, the emphasis has actually been on the *competence of people* to use the products and services that are under development. Focusing on usability has fostered a view which tends to see products as tools and people as cognitive and physical components within a human-technology system. This approach can even be seen as dehumanising (Jordan, 2000). It may produce successful outcomes of technology development, but the products would be successful only in the sense of high usability, i.e. efficient and easy to use. These qualifications, however, do not entice people to use products if the products as such do not support people's everyday life (i.e. their significant areas of life) and the values that they follow (Leikas and Saariluoma, 2008b).

This is why, in this constantly changing technological world with new kinds of usage cultures, we need a more multidimensional and holistic approach to HTI design in order to understand what technology could really offer for people and in what forms and on what terms it would be welcomed and adopted. This approach can be found from the perspective of human life.

Ultimately, the goal and focus of technology design should be in *enhancing the quality of life of people,* and traditional usability attributes, such as efficiency and effectiveness have little to do with this desire as they do not connect technology to life. Fundamentally, quality of life reflects the basic issue of philosophy about good life (Nussbaum and Sen, 1993). During the last decades this issue has been studied in other sciences as well (Saarni, 2008). According to WHO (1994), quality of life is an individual's perception of a person's position in life in the context of the culture and value system where s(he) lives, and in relation to her or his goals, expectations, standards and concerns. The development of products and services should thus be based on understanding how people can and wish to live with technology, not only how to use it.

In this respect, often the main reason for not using technology is that the technology offered does not fit in the purpose of enhancing the quality of life of people. This means that it does not reflect the socio-cultural and physiological determinants, i.e. hopes, values, lifestyles and mentalities that people experience in their life. If the design of new products and services is based merely on the usage, i.e. goals, tasks and operations of the system, and providing the user the capability and know-how to access the technology, the users will never fully

benefit from the innovations of technology. Instead of designing *how* the users should behave when they use technology we should concentrate on designing for *what* people actually want to achieve and do in their life and *why*. We should focus on the 'wants' and goals of people instead of such 'hows' as 'usability' and 'user satisfaction'. These may well affect the quality of use, but consumer satisfaction depends on the added value that the product brings into people's life, the 'wants' and 'whys' that make people purchase the product in the first place.

Of course, the usage of a product as such brings value to the user, but different values and motivations also guide the selection and purchase of a product. The tradition of human-centred design has focused on the former one, namely on the questions of the usage situation of the product as well as on different usage patterns. However, along with the usage of the product we should consider the factors that are connected with the selection of specific products and that influence the purchase decision of a particular product in the first place.

Redström (2001) discusses different forms of use of utility things (originally introduced by Paulsson & Paulsson, 1957) which the designer has to acknowledge. These are *practical use*, *social use*, and *aesthetical use*. Practical use is in question when we, e.g., use a saw to cut timber or when we use a boat to cross a lake. Depending on the model, the boat can also have a strong symbolic value in social use, especially a motor or a sailing boat. Social use concerns the symbolic values that different artefacts have in social contexts, in other words, the roles that things play in our social life. An example of this might be the usage of a tie in different occasions. For some people it is a symbol of respect for the occasion, whereas for some it might be a negative sign of a social class. The third form of use, aesthetical use, concerns reflective use, e.g., choosing a product because of its beauty. In a way aesthetical use goes beyond both practical and social use as it concerns our most immediate use of any product and is steered by our immediate perception of things in terms of likes and dislikes. (See also chapter 1.5.6: The design for pleasure.)

In this light the design should consider the additional value that technology brings to users. Technology should exist not for itself, but rather for bringing added value to the everyday of people, thus improving the quality of people's life. Therefore the aim of HTI should be to consider the human-technology interaction in a much larger context than within the context of using technology. In addition to physical usage environment, the impact of, for example, psychological and social environments of the users should also be taken into account in the design. This calls for a holistic consideration of the problem at hand, without

necessarily getting off the ground with technology first in mind as the primary solution.

Carrying out product design from a more holistic point of view means to shift the angle of view from the demand of competence towards the *design for life*. This means that product design should not focus only on the fit of a product or system to a person's cognitive and physical characteristics. Instead, it should be based on understanding of human factors in a broader sense and on recognising the user as more than merely as a physical and cognitive processor (Jordan, 2000). This requires understanding of different elements of people's everyday life in the justification of the design goals and design decisions.

Shifting the angle of view to people's life means also shifting the stress of user studies to the very early phases of the design instead of focusing mainly on testing different attributes of the user interface. Of course, from the technology development point of view, it is important that people like to use the technology or service (Norman, 2004). However, they are not interested in the underlying technology, but simply in what the product or device can do for them. The design methods should thus focus on finding out the possibilities and restrictions, strengths and weaknesses that arise from people's life in relation to technology. In this way it would be possible to design solutions that people really would like to have and learn to use.

So far, the traditional HTI research and design has overlooked the basic elements that constitute the everyday life. We have several methodologies for investigating usability and user needs, but the knowledge of people's life and its implementation in the early phases of design is on a lay level. Therefore it is logical now to shift the question to the analysis of life.

3.2 Traditional concepts to capture aspects of life

There are a number of notions which introduce people's lives in different ways. The basis of these notions is in sociology and thus the way how they examine life is naturally related to sociological concepts. These notions include 'mentality', 'habitus', 'life area', 'lifestyle', 'way of life' (also "way of living"), 'everyday life' and 'quality of life'. They are more or less floating dimensions of life and represent different subjective and shared choices people make in relation to their lives. In this sense, they can be used, from their part, to investigate what might constitute such phenomenon as life (Figure 3).

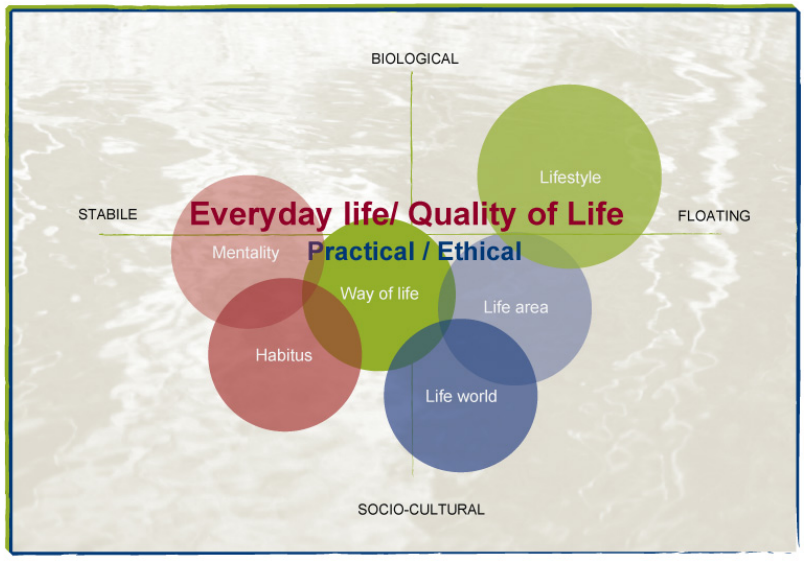


Figure 3. Traditional concepts of different aspects of life.

The '*way of life*' is a commonly used notion to describe the everyday life of people. E.g., in sociology, typical features for different populations have been described based on people's way of life. Weber, e.g., speaks about the way of life in his "Protestantische Ethik un der Geist des Kapitalismus" (1980) and explains a historical process from this particular point of view. Weber sees the origins of capitalism in a specific way of life formed by religion. In his "Wirtschaft und Gesellschaft" (1978, p. 302) he also analyses and illustrates the way of life connected to different status groups.

According to Roos's (1988) definition, the way of life is an organized entity formed by living conditions and life history and dispositions of life, and connected to people's activity. It may be a way of life of an individual, family, social group, gender, generation or a social class. For Roos, the way of life is a means of structuring life.

The changes in people's way of life happen very slowly, if at all. Our way of life is 'given' by the society where we belong to, and we can execute our way of life also subconsciously. The activity and choices that arise from the way of life are based on the habits and customs which we have internalized. These habits and customs can not be explained by external factors, independent of the activity itself. They are a quite salient part of every society and group, and people follow them remarkably faithfully. (Allardt, 1986.)

Very often the notion ‘way of life’ appears in health related research. People want to lead a healthy way of life, which then is realized on a conscious level. Also, in the context of alternative movements or alternative ways of living, the way of life is an often used term. The way of life manifests the culture one belongs to, but does not comprise as such a subculture or a part of culture. However, in the same culture, different ways of life usually have some common denominator (Roos, 1988).

‘*Mentality*’ is a term used in the context of way of life, mostly in relation to populations and tribes. It was employed in social history to explain different variations in everyday activity and schemes of things. Already Durkheim talked about collective states of mind that would combine different norms, beliefs and ways of consciousness (Durkheim, 1930/1985, pp. 7–29). According to Allardt (1986) the studies of mentality have focused on such more or less stable and central phenomenon as death, love, fear, and maternal instinct which cannot be explained only through social norms or social class. These, Allardt argues, can have a significant impact on studying change in history.

‘*Habitus*’ is also a way of conceptualizing and valuing life, and explains the way of life with relatively stable and subconscious factors. According to Bourdieu (1979), habitus consists of life history, historical experience, and customs of people, constituting a system of internalized attitudes and policies. It is the unifying principle of practices in different domains (Bourdieu, 1977). According to Gilleard and Higgs (2005, p. 70) habitus is “derived from, but not defined by, the distinctive actions of particular people in particular settings or fields”. Roos (1988) explains that habitus is a personal system of activity inclinations. It determines the choices we make that form our perceivable way of life. It also determines how a person appreciates or rejects different ways of life. Habitus is influenced, not only by one cultural class but by many cultural values. Diverse subcultures constitute the grounds for the development of different habitus.

So, habitus is a kind of internalized readiness to act, connected to cultural capital. It is seen as people’s tendency to act or make choices in a way that suits their already internalized lifestyle. Habitus has its roots already in the primary socialization and forms gradually throughout life. So the background of this cultural capital is in a person’s childhood wherefrom it radiates to the later course of life. In a way, habitus gives stable meanings to the choices made. To someone with a strong habitus, a change forced from the outside – like for example retirement – can be a tough experience and cause serious difficulties to adaptation.

'*Lifestyle*' is another concept worth introducing here. According to Allardt (1986), the choices we make in our everyday life concerning, e.g., consumer products can be explained from three different viewpoints. Our choices can be (i) a part of our way of life, (ii) based on discretion, or (iii) reflections of fashion. The viewpoints that stress the influence of fashion usually emphasize external impulses, whereas discretion explains the basis of our rationality, i.e., why we choose some product and not the others. Thus, according to Allardt, fashion and discretion together constitute our lifestyle.

Originally, lifestyles were discussed as a consequence of individualization and globalization (Scheiner and Kasper, 2003). The notion gained relevance as a new dimension of social inequality in the context of increasing social and cultural differentiation. Lifestyle can be seen as a thinner notion than 'way of life'. It represents our everyday activities based on consumption. It includes features of individual discretion, trends and fashion, involving thereby some amount of change. Way of life is nearly unchangeable and socially assigned, whereas lifestyle can be seen as more individual, and as forming very few bonds with social structures. Contrary to way of life, lifestyle can be at the same time private and public, as is the case with fashion and taste. We construct our lifestyle through consuming, dressing, and liking, whereas our way of life is constructed mostly through our activities and the way these are appreciated. (Allardt, 1986; Roos, 1988.)

'*Life area*' refers to more stable aspects of life than lifestyle, such as working, studying and spending free time. It thus defines the kinds of things people use their time for, whereas lifestyle defines how they use their time. For example, travelling is a life area, and may be regarded as a natural attribute of some form of life. The significant life areas for older adults, for example, are well-being and health, activities of daily living and spending time with friends and relatives.

'*Life-world*' is according to Habermas a subjective reality based on interpersonal communication among people and understanding of each other, where meanings, interpretations and symbols are most important. Habermas uses the term 'Lebenswelt'. Life-world includes spatial and temporal social dimensions of our life as well as lived experience and cognition in the everyday life (Schutz and Luckmann, 1973/1980). The everyday reality of the life-world includes, not only the nature experienced by the person him or herself but also the social and therefore the cultural world in which we find ourselves. In the life-world we are always in a situation and the situation is always socially conditioned, and the context and social reality are interwoven. The reality of the everyday life-world

is a social reality, possessing social structures of relevance into which everyone is born, and in which we live and grow older with our fellow-men.

The life-world is not a rational, conceptually manageable entity. It includes culture, social community and personality. According to Schütz (1932/2007), the life-world is a social playground between individuals, to which an individual's own actions create goals and meanings. Thus it sets individuals in contact with significances which open up in the interpreting acts of consciousness. Meaning is created through a person's earlier experiences and interpretations. Thus the life-world is the part of the reality that an individual comprehends, and the person's own plans and goals are projected on it. The life-world is visible to oneself but invisible to others.

'*Everyday life*' is the stabilized and organized life, the organized nature of which is valuable to an individual. Thus, it is the way how a person organizes her or his life. In Roos' opinion (1988), questions of everyday life include especially those concerning problems of safety, human relations and lifestyle facades. According to him, everyday life is the part of life where "nothing comes true and nothing works out" (Roos 1988, p. 48). Roos' characterizes everyday life as desperate. According to him the daily life of many people is characterized by the hope of breaking away from the everyday life, as an ever greater part of life is "pure grey of everyday" (Roos 1988, p. 50). On the other hand, it is often also said, that happiness arises from small everyday matters.

All these concepts open up an important perspective to analysis of life. However, they more or less lack the viewpoint of psycho-biological factors as one of the determinants in the life of people. That is to say, none of them is concerned about the influence of biological factors in life. For example, the effect of getting old and facing decline in physical abilities is more or less neglected in these concepts, because these phenomena cannot be considered with social concepts. Becoming old means social change but it is essentially a biological phenomenon. Being poor and uneducated is a social state but it is also related to ecosphere and climate, for example. This means that we need basic theoretical concepts which enable us to consider the user groups in terms of biosocial analysis, also (Saariluoma and Leikas, submitted).

The only recent life-analysing concept that includes a biological view of life is *quality of life* (QoL). It is a broad ranging concept, incorporating in a complex way a person's physical health, psychological state, level of independence, so-

cial relationships, personal beliefs and relationship to salient features in the environment[2]. Thus, unlike the other concepts mentioned above, it covers also one's physical ability, although as a subjective conception. A multidimensional definition of QoL includes such areas as subjective satisfaction, physical, mental and social ability to function, and availability of necessary resources (material standard of living and social support) (Katsching et al., 2006). Thus, QoL can be assessed from an objective and a subjective perspective (Artz, 1996). As an objective phenomenon QoL is measurable and reportable, independent of the specific experiences of individuals. As a subjective phenomenon it is something that every person experiences but is difficult to report in a meaningful way. The objective view, a highly operationalized and quantitatively measurable concept, is an approach used in social and health research (Saarni, 2008) and uses concepts such as leisure time and disposable income as measures of QoL. Subjective quality of life is a qualitative individual assessment of the general positive or negative quality of the sum of that individual's life experiences. Many attempts have been made to label this phenomenon, including personal expressiveness, subjective well being, and optimal experience, but the most easily understood term is happiness. Aristotle believed that happiness is the only goal that is an end in itself (Aristotle, n.d., trans. 1984, 1097b20). In this sense, from the philosophical point of view, the question of the definition of QoL approaches the fundamental question of ethics, namely the definition of a good life or the meaning of life (Nussbaum and Sen, 1993). Also, a question of what makes a person's life better in terms of quality of life also arises in the course of a moral argument about what our duties and obligations are in making people's lives better or at least preventing them from being made worse (Scanlon, 1993). The problem is that quality of life rather measures how good life is instead of analysing its contents.

The notions that I have presented above illustrate life from different sociological perspectives and consider thus the phenomenon of life from quite a few viewpoints. However, none of them can be seen as a comprehensive view which would include all the other aspects from all the notions above. Also, they examine life from a sociological point of view, ignoring thus other perspectives to life. For example, such aspects as biology and genetics are not fully covered in

[2] An interesting point is that in many Finnish–English dictionaries, a Finnish word 'quality of life' is translated as 'way of life'.

these notions. Only ‘quality of life’ includes a view of biology, but this refers only to experienced physical health.

In addition to this sociological view, we have to ask now what would be the other aspects besides the sociological ones that would be important to open up and understand in the phenomenon of life. This problem shall be discussed in detail in the next section.

3.3 Multidimensionality of life

It is evident that the sociological concepts and related methods can really aid us in capturing aspects of life. This kind of research provides important facts about what people and their lives are, and it is evident that psychological research, for example, would not give us a similar perspective to life. Sociological concepts often describe the ways people act in society and thus they fruitfully elaborate about understanding of human life in design.

However, a deeper understanding of what happens in life presupposes explanatory thinking. It is not sufficient, e.g., that we are able to describe what happens to people when they become old, we also have to know why this all happens. In this kind of analysis, sociological concepts and perspectives are not necessarily effective, because the true reasons for the phenomena are not caused by social structures, social habits or social communities. Often there are reasons other than sociological phenomena, which explain the forms of social life.

When people become old, the social structures are not the ones that are first and foremost influenced. Some social decisions, such as retirement, affect older peoples’ social life, but becoming old is not only a social phenomenon. It is also an essential biological phenomenon and it has many psychological aspects as well. This means that mere sociological concepts cannot give us sufficient information about what is relevant in designing for life. Instead, it is essential that human life is investigated in a multidisciplinary manner.

For example, in the design for older adults it is necessary to understand that older people have weakened senses and less dexterity in their hands compared to young and middle aged people. However, this change in people’s physiology is not explainable sociologically, although it is commonly experienced by older adults. The explanations for the change are biological. Indeed, life is in many ways biological and we have to consider that in the design of new technology.

Becoming old is also a psychological phenomenon. Often cognitive capacities such as the functionality of human memory changes, dexterity of movements

and performance of senses change. There are also other types of important changes: the contents of life alter, the ways people spend their time do not remain the same as in the middle age, and people's personalities and ways of thinking alter in many essential respects. Very often the psychological changes witnessed have their origin in physiological aging. This means that we have to pay attention also to many psychological and physiological aspects of life and be able to understand them in a sufficiently accurate and versatile way in our design.

Indeed, it is important to ask here what types of scientific knowledge are needed in designing human-technology interaction. In order to answer this question it is useful to provide an overview of the typical problems concerning older adults and the knowledge used to design HTI solutions for these problems. After this overview we can much better answer to the question of what kinds of synthetic concepts we need in designing human-technology interaction for older adults.

The main *physiological* and *medical* problems related to older adults' ICT usage are related to user interfaces and decline in physical functional capacity. Low vision and impaired dexterity, for example, create demands for the design of screens, controls and keyboards. Solutions to these demands have been studied, for example, in the area of *psychology*. From *social-psychological* point of view, older adults' coping in life has highlighted many problems for technology design, such as people's competence in adopting and using technology. Further, ICT literacy, digital divide and the issues of efficient user training have been studied in the area of *educational science*. Also, a very topical area, technology for independent living, has challenged experts in *occupational therapy* to bring their understanding of the concept of activities of daily living (ADL) to this problem area. *Cognitive science*, from its part, is faced with challenges due to declining cognitive capacity, such as memory and perception of older adults and their influence on the usage of ICT technology. Finally, considering people's values in life, such as promoting social relationships, preventing loneliness and facilitating meaningful roles for older people are all challenges for technology design from the *sociological* points of view.

3.4 Summary

I have discussed here everyday life as a distinct challenge for the design. Understanding life is a prerequisite for understanding the goals of people and thus the goals for the design. However, traditional concepts to capture aspects of life do not have sufficient power of expression to provide us with the knowledge of what is

relevant in designing for life. If we wish to understand the phenomenon of life of, for example, older adults and its significance in technology design, we have to look systematically what kinds of problems are actual today when designing for older adults. On this ground we can get a concrete idea of what kind of scientific knowledge bases are vital in developing a new ground for designing for life. The examples presented above make one ask whether it would be possible to find a new and more multidisciplinary conceptualization for analysing life and designing technology. This conceptualization should provide us with information about different aspects of human life from different sciences and perspectives.

So, we still need basic concepts which allow us to think synthetically and constructively in design. As the examples show, it is not good to break the design process into absolutely separate scientific disciplines, which do not communicate with each other and which in the worst case begin to demand monopoly for the whole design process. Unifying concepts are needed to make interdisciplinary discourse easier and to improve design management so that the design outcomes could really succeed in their ultimate goal in enhancing people's quality of life. They must express social, as well as psychological and biological aspects of human action.

Designing for life means that we need to commit ourselves to a holistic approach of human-driven design and to problem-specific ways of conceptualizing interaction issues. We must ask what kinds of concepts we have at our disposal for the analysis of human-technology interaction from the perspective of everyday life. What might be the notions through which everyday life can be understood? Obviously, they extend the area of the technological concepts, and their intuitive basis is in the analysis of human models rather than in technological ones.

My suggestion is to take the notion '*form of life*' as the basic concept in analysing the relations of everyday life and technology and thus consider 'form of life' as a premise for designing for life (Leikas and Saariluoma, 2008b; Saariluoma and Leikas, submitted). Investigating different elements of a specific form of life can open up requirements for the intended technology from biological, psychological and socio-cultural points of view, all of which are necessary to form a holistic understanding of people's needs and preferences. The rationale behind the form of life notion is explained in the next chapters.

4. Form of life

4.1 A definition

Our life, to a great extent, consists of different rules and regularities that we follow. We usually follow these rules in similar situations in the same way. We have breakfast, take the car and drive to work. These regularities can be referred to as rules that direct people's actions. They can be officially fixed, such as tacit rules at the work place, or juridically determined, such as traffic codes, but most often they are just ways to act in life.

The rules and regularities in our life are not autonomous but relate to each other, thus combining together different systems and codes. Golfers, for example, belong to a club, participate in golf tournaments and talk about golf with other golfers. Also, older people may live in a block of serviced flats, look after their own wellbeing, pay visits to friends and relatives, and participate in hobbies and activities of retired people, such as theatre trips, concerts and tours for "sunny seniors".

This kind of combination of rules and regularities that directs people's actions may be called 'a form of life' (Wittgenstein, 1953)[3]. This notion has been used as a part of sociological discourse (Bauman, 1997; Giddens, 1990), but should not be studied only from a sociological perspective. In addition to social elements, our life is determined and shaped by biological and psychological factors. All these three basic and interrelated factors are essential in understanding how and why people participate in different forms of life and what is the structure of the forms of life. These elements together influence the different possibilities we might have to shape our life and the possible choices we make as well as con-

[3] The German original term for 'form of life' is 'Lebensform' (Wittgenstein 1953, §19).

tents we create to manage, e.g., our lifestyle. Form of life is thus a set of rules and regularities that people follow when they participate in a form of life, and biological, social and psychological factors make these rules and regularities understandable and rational.

The rules and regularities of forms of life can be divided into three types. The first type consists of legal rules or social norms. Examples of these are, for example, traffic codes and distribution of an inheritance. The second type consists of conscious ways of acting. These include, for example, habits and attitudes, and they can be seen, for instance, in the Catholic Church's Easter rituals or in the Finnish habit of having sauna every Saturday. The third type consists of unconscious tacit regularities in behaviour. These tacit rules for social interaction include, among others, the rules of conduct and etiquette that people follow when visiting each other.

A form of life is not always a voluntary choice. An individual does not usually choose the form of life but is "thrown" into it. For example, Swedish-speakers in Finland are brought up to follow the rules of the form of life of their community. Accordingly, a woman born in Scandinavia might have a different conception of the roles in the family than one from the Middle-East.

In fact, there is an unlimited number of forms of life around human beings. As can be seen from the earlier examples, golfers and older adults participate in these different forms of life. However, they may also share the same form of life, as would be the case with senior golfers. These same people may yet participate in other forms of life, for example, in that of social democrats, bird-watchers, slow-food lovers, or parents of a disabled child, and again they might share these forms of life with other groups of people.

Rules of forms of life are not mechanical. For example, an art lover may neglect a recent exhibition of Gallén-Kallela in the city museum because she is travelling at that time. In this case the form of life of a traveller becomes more important for the moment. Also, a traditional way of spending Christmas together with a family and relatives and the habits that are included in it are a part of a form of life. However, in some year a person may decide to spend the Christmas time differently, e.g., by travelling to a sunny beach in the Southern Europe. Thus, sharing a particular form of life may vary from the preparation of important festivities of life to a simple participation.

People can have very diverse forms of life. Wittgenstein (1953) created this notion in order to establish the basics for his theory of language games. He noticed that people participate in countless number of language games. The lan-

guage game of a sports enthusiast, for example, is different from that of a police officer, although also the police officer might be a sports enthusiast. The meaning of language depends on the context and the language game in question.

Through participation in many forms of life an individual creates the regularities which (s)he follows in life. They are present in the mind of an individual and are followed in different actions. They create sense and order in the ways of action, and without them the actions would be random and irrational.

Forms of life as such are not unchangeable, and their contents are shaped by many different factors. Many significant forms of life have already vanished in the course of time. We do not, for example, go hunting any more in order to feed the family but instead drive to a supermarket to buy food. Thus, the change in forms of life can be related to different extrinsic factors such as changes in economic structures in the society and many consequences of ecological change.

4.2 Brief introduction to the history of form of life

Wittgenstein (1953) introduces his idea of forms of life by explaining that human forms of life are defined by the fact that they are forms created by language, and that language is the mark of human sociality. For some reason, this has not been widely considered by researchers in ICT design, and the form of life has attracted little attention. One reason may be that Wittgenstein did not clearly explain what his idea of the form of life actually is. Thus, further discussions and debate have been carried out mostly on different readings of Wittgenstein's explanations and not so much about the real contents of form of life.

It is true that we do not necessarily know what Wittgenstein precisely meant by forms of life, because he wrote only some remarks about them. Nevertheless, the underlying idea of an individual's actions as part of a system of regularities opens up an interesting view to human existence (Bauman, 1997; Giddens, 1990) and makes it possible to examine the contents of life.

For Wittgenstein, language (basic linguistic practices which he refers to as 'language games') and form of life are intimately interrelated. However, he makes only a few remarks which can be interpreted to refer to form of life. These appear in his "Philosophical Investigations" (1953):

1. "It is easy to imagine a language consisting only of orders and reports in battle. – Or a language consisting only of questions and expressions for

answering yes and no. And innumerable others. – And to imagine a language means to imagine a form of life." (§19)

2. "Here the term "language game" is meant to bring into prominence the fact that the speaking of languages is part of an activity, or of a form of life." (§23)
3. "So you are saying that human agreement decides what is true and what is false? – It is what human beings say that is true and false; and they agree in the language they use. That is not agreement in opinions but in form of life. " (§241)
4. "Can only those hope who can talk? Only those who have mastered the use of language. That is to say, the phenomena of hope are modes of this complicated form of life. (If a concept refers to a character of human handwriting, it has no application to beings that do not write.)" (p. 174)
5. "It is no doubt true that you could not calculate with certain sorts of paper and ink, if that is, they were subjected to certain queer changes – but still the fact that they changed could in turn only be got from memory and comparison with other means of calculation. And how are these tested in their turn? What has to be accepted, the given, is – so one could say – forms of life." (p. 226)
6. "If a lion could talk we could not understand him." (Part II, section xi.)

In addition to the references above, Wittgenstein has also referred to form of life in his Lectures and Conversations on Aesthetics, Psychology and Religious Beliefs: "In order to achieve clarity on aesthetic expressions, one must describe forms of life." This, however, is not a collection of Wittgenstein's actual writings, but of notes taken by students during lectures in German, and also cited "In order to get clear about aesthetic words you have to describe ways of living" (Barry, 1996). This obscurity of different terms in the citations well describes the confusing readings and usage of the concept form of life and its relations to other concepts, such as way of living.

The few interpretations of Wittgenstein's form of life term differ somewhat from each other. Hunter (1986) in his reading argues that form of life is the organic model which is closely related to biology, stressing thus the individual view instead of that of language-games and their social aspect. He points to the importance of activity in the form of life, i.e., the person simply functioning the

way that s(he) does. Garver (1990) for his part, has interpreted Wittgenstein's writing in a way that there is only one human form of life, framing the common behaviour of mankind. This again is somewhat in contradiction to, e.g., Barry's (1996), Conway's (1989) and Finch's (1977) opinion who argue for multiple human forms of life. Also Hintikka and Hintikka (1986) and Hilmy (1987) believe that there are indefinitely many forms of life, but they limit the consideration of forms of life to much the same as language-games.

Haller's (1988) opinion is slightly different from these. He claims that we may be involved in two different kinds of form of life: a singular one comprising "the common behaviour of mankind" and a multiple one with different forms of life within this common set of behaviours. This view is strongly criticized by Barry, who suggests that at the level of 'common behaviour' there may be only a single form of life, but there may also be other forms of life with characteristics at completely different levels. For Barry, form of life and language-games are closely connected, but not identical. He argues that for Wittgenstein, the determination of form of life and language runs primarily from the former to the latter. To think of language, he claims, is not to limit in any way the form of life in which it exists, because it is not possible to know how the words are applied if we do not know what they mean. However, if we consider the form of life, we are be able to set some parameters on the language.

Gier (1980) combines the views of the authors above by explaining that the concept of form of life is based, not on biology or on language *per se*, but on the social and cultural bases which form the surroundings of the lives of people. Wittgenstein himself also believed in cultural and linguistic relativism. Very few statements about form of life have been introduced in this millennium. Lash (2001) has followed Gier's way of thinking in arguing that forms of life embrace both natural and biological forms of life, on the one hand, and social or cultural forms of life, on the other.

Lurie (1992) speaks of culture as a human form of life. According to Lurie, man as a cultural being emerges in Wittgenstein's remarks where Wittgenstein describes the religious, artistic, and ritual manifestation of the 'spirit of man'. These also have interconnections with his remarks of forms of life. For Wittgenstein, language-games were connected, e.g., to such topics as naming, meaning, intending, thinking, knowing, sensing, learning, and understanding. Lurie argues that cultural practice exemplifies what Wittgenstein labels a human form of life. Cultural practices have the nature of socially administered and refined deeds. They are "ways of behaviour that grow out of natural life through the creative

efforts of certain human beings and which, through the ministration of their joint judgements of those who follow them and participate in their observance, are turned, thereby, into cultural practices" (Lurie, 1992, p. 199). For Lurie cultural behaviour comes about from the refining of natural forms of life through the adoption of, and the adaptation to, shared practices and common judgements. Cultural practices are created, acquired, preserved, and administered by the human beings who partake in them. Thus, as Lurie points out, patterns of our behaviour, which exemplify cultural practices, as such exemplify forms of life which demonstrate the existence of a spiritual bond between human beings. Without the ministration of a particular culture, human beings lack recognisable human forms of life.

Das's (1998) reading of Wittgenstein's form of life is rather similar to that of Lurie's. For Das, culture is a matter of shared ways of life as well as inheriting capabilities and habits of members of society. Thus, culture is participation in forms of sociality, according to Das's interpretation of Wittgenstein's form of life. Das argues that for Wittgenstein, language is the mark of human sociality, and hence human forms of life are defined by the fact that they are forms created by and for those who are in the possession of language. Das points out that the agreement on forms of life, in Wittgenstein, is never a matter of shared opinions.

According to interpretations of Wittgenstein above, there can be several language-games as there are also a variety of forms of life. Also, in a certain culture a specific person may carry out several language-games, e.g., language-games of work, home, neighbourhood pub, summer cottage, etc. Language-games are an essential factor in creating the focus of the context where people execute their form of life.

There are different elements in people's cognitive behaviour which construct the forms of life. According to Garver's (1990) reading of Wittgenstein, *hoping* is one mode of a complicated form of life which distinguishes human beings from animals. Garver argues that mastery of language is necessary and sufficient in order for someone to hope. According to Barry (1996), *understanding* is another mode of form of life. It is a mode of subjectivity: either you can understand what someone says or does, or you cannot. If you can understand, you may share the same form of life.

The hard core of Wittgenstein's notion seems to be that people follow rules when participating in forms of life. For some reason, Wittgenstein did not extensively explain his idea of the form of life. Thus, it would be pointless to go to any more detail in Wittgenstein's notion. This means the form of life as he sees

it, cannot be taken but as an initiation. It must essentially be elaborated so that it could provide a good basis for the natural paradigms of human-technology design (Saariluoma and Leikas, submitted).

It is good to see that form of life is closely related to language games and uses of words in them. This means that form of life is a dynamic concept that covers the elements of life that are meaningful from the point of view of orientation in life. In this view form of life is about creating and sharing *meanings*. It includes the life situation where people live and the attitude that they have towards that situation of life. It can thus be reviewed only through different factors that might constitute the meaning in a situation of life of a certain group of people. The factors that create meanings can be both stable and dynamic. They are determined by certain preconditions in people's lives and become visible through both shared and individual meanings and attitudes towards activities in life. These in turn become visible, for instance, in values that people follow, which in turn influence customs and habits, choices in lifestyles and ways of life.

From the viewpoint of my study, what Wittgenstein may or may not really have meant is less important than the fact that form of life as a whole can be a concept worth having when examining people's ways of realizing their life. I believe that by broadening the concept, e.g., the way Gier (1980) and Lurie (1992) have suggested and examining it in the light of biological, psychological, social and cultural factors we can have a suitable concept for understanding the basics of our bias towards meaningful paths in life. Biological factors represent the most stable and 'given' factor of forms of life whereas psychological, social and cultural factors with arbitrary signs and meanings may evolve and change. In this sense, biological factors can not be left unnoticed in the design, and, e.g., the forms of life of older adults can not be studied without the biological point of view.

An interesting version of the concept of form of life has been presented by Lash (2001). This is '*technological form of life*', where people make sense of the world through technological systems. Technological systems work through functions of intelligence, command, control and communication. According to Lash, we interface with our environment through these systems. When using, e.g., a mobile phone, we operate as a man-machine interface, i.e. as a technological form of life, because we must navigate through technological forms of social life. Lash argues that technological culture is constitutive culture at a distance. Thus, technological forms of life become forms of life-at-a-distance. Hence, in the technological form of life we can not achieve sociality apart from our ma-

chine interface, in the absence of communication technology. In this, according to Lash, there is a danger that forms of life become flattened and lifted out.

Lash's view is different from the one I suggest. I examine such elements of form of life where individuals live out their life mainly through narrative and discourse. For Lash, in the technological form of life the world relates to individuals through artificial networks and abbreviated units of information. Technological forms of life are disembedded and take increasingly less and less the characteristic of any particular place, thus having no context at all. As I see it, technological form of life can be seen as a specific lifestyle, e.g., for individuals who spend most of their work and leisure time interacting with technology. These are people who, e.g., keep up their social contacts mainly through the Internet or mobile technology and, in the extreme cases, create another personality for the cyberspace. Thus, in my view, technological form of life can be seen as a lifestyle, a notion which belongs to one of the conceptual attributes of form of life. Lagerspetz (2005) has considered this similarly when saying that, "we use computers and incorporate them into a human form of life" (Lagerspetz 2005, p. 199). The conceptions of Lash and Lagerspetz give, on their part, a justification to my attempt to base the analysis of life on forms of life in ICT design.

4.3 Concrete properties of forms of life

4.3.1 A holistic view

The way the concept of form of life is presented in the following does not precisely follow the idea of Wittgenstein but arises from his thinking. Form of life deals with people instead of individuals. This premise makes it possible to use this notion in the development of products and services. Of course, from an individual perspective, people can have, for example, a certain way of life, but examining a form of life always binds the point of view to a larger group of people. In this respect, forms of life can be examined for example through cohorts, for instance, certain generations with certain nationality and background.

The preconditions that are prerequisites for the emergence of a particular form of life arise from biological, socio-cultural and psychological factors (Figure 4). Some of them are more or less 'chosen' by the individual and may be dynamic in nature, whereas some are ´given´ by genetics or living conditions and thus

constitute stable factors of the holistic form of life. An example of such a stable factor determined by living conditions can be, for example, being a war child.

This means that people are placed to the pre-existent forms of life and have little possibilities to change them. Forms of life are formed by the biophysical conditions of the person as well as by customs, habits, rules, and language games, not only of the person in question but of so many other people, also. Thus, form of life is a holistic notion including predetermined factors in life as well as an agreement of a complex variety of different elements in everyday life (Saariluoma and Leikas, submitted).

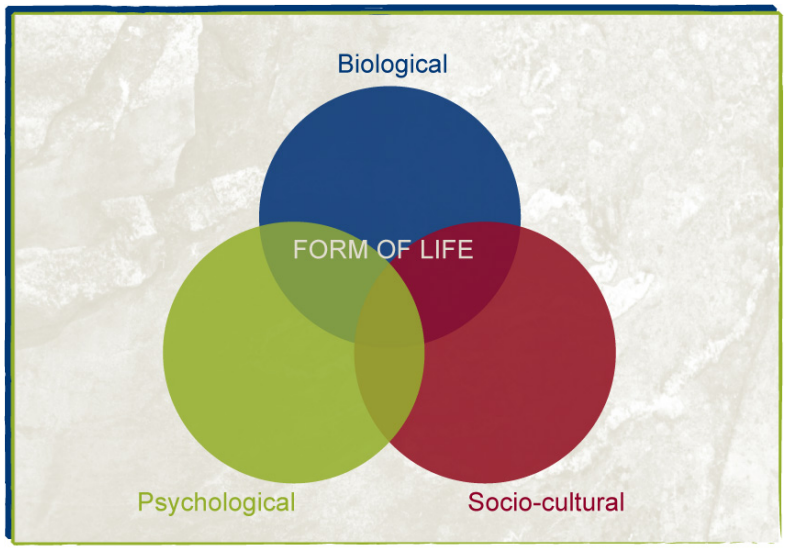


Figure 4. The different elements of form of life.

Broadly thinking, for example, ecosphere determines biological preconditions of forms of life. Examining ecosphere within an individual biology, such as illnesses or age, may make the biological preconditions of forms of life understandable. For example, the life conditions and needs of young Africans are very different from the respective conditions in Europe. Illnesses such as Aids can essentially change traditional forms of life. Similarly, from the socio-cultural view, life in democratic countries may be very different from life in dictatorships and also the forms of life, including, e.g., the values people follow, may vary accordingly. Finally, many psychological phenomena such as motivation, emotions, personality and group processes may be important determinants in the formation and development of a form of life. (Saariluoma and Leikas, submitted.)

So, our biology inevitably determinates our forms of life, but only up to a certain point. As an example, people of the same age group share the same biological element of forms of life. In addition, however, along with age there may be many different factors that influence the formation of some forms of life. These factors include, for example, functional capacity and health condition. Retired people, to give an example, establish an increasing variety of post-work lifestyles and may thus share many different forms of life, such as forms of life of active people and of those who are fragile. However, the stable biological element, the age, remains quite predictable in its effects and determines, from its part, the formation of specific forms of life. Consequently, all people of the same age group usually share a specific form of life, that of people born during the same period measuring some years.

Social scientific analysis can also help us in understanding how and why people participate in different forms of life and share the rules and regularities that are included in them. These rules and regularities appear as behavioural patterns, which idea is supported, for example, by Giddens' thinking (1990). However, forms of life cannot be regarded merely as rules but rather as holistic systems, which have their contents as well as their preconditions for existence. In this way, the notion of form of life combines the thinking of Wittgenstein (1953), Bauman (1997) and Giddens (1984) as well as the theory of mental representations (Markman, 2000). (Saariluoma and Leikas, submitted.)

The contents for the rules and regularities of different forms of life can be seen as socially shared patterns of actions represented in the minds of people (Saariluoma and Leikas, submitted). For example, religious behaviour, taking care of children, being a student, a housewife, an inmate in prison, an environmentalist or a nerd could all provide examples of participating in different forms of life. In essence, forms of life are mental contents, a set of rules people follow in certain contexts in their daily life. These rules and regularities are not mechanical but include also our emotions. How they are represented in people's minds explains the terms for the emergence, maintenance and transformation of different forms of life. Free time, for example, as such cannot be seen as a form of life, but the ways how people spend their free time constitute a part of different forms of life.

Forms of life can be private or public. When a number of people behave following the same or similar rules in a social context and are thus unified by sharing these rules, we can say that they participate in the same form of life. This form of life has its mental representations with respective mental contents as

well as external expressions in the action patterns that these particular people follow. Ice hockey players, for example, share their sporty way of life. They belong to the same age cohort, share the same aches in the body, exercise every day, travel to different cities together to play the game, share the publicity and after game sessions, and participate in a hockey player's form of life in many other ways, too.

According to this view, the form of life covers the system of different subcultures that individuals participate in, the meanings and objective conditions they share, the way of experiencing life and the mode of doing things. In an everyday level, forms of life are realized by the intuitive and intentional actions and everyday activity that people perform based on their specific interests in life. The outcome of one's everyday activity consists of individual and shared experiences, which on a subjective and objective level describe the materialisation of one's form of life.

Forms of life are shared by individuals, and an individual person may participate in several forms of life (Bauman, 1997). In fact, each human being participates in many forms of life. There are also many forms of life that would be impossible to participate in. For example, a 60-year old woman may share many forms of life with other women from different age groups, but it would most likely be impossible for her to participate for instance in the form of life of pregnant women.

Sometimes forms of life are not communicative but people follow the same patterns, being ignorant of each other at the same time. They perhaps know that other people share the same forms of life, but they do not have to be in any communicative relation with each other. E.g., being unemployed or being rich is an example of this. Sometimes forms of life are highly communicative as in the case of family life. Sometimes they are hybrid as in the case of belonging to a national culture. This means that the forms of life are not unified by communication but by the information contents of action patterns and respective mental representations. (Saariluoma and Leikas, submitted.)

There is a temporal dimension, which is not self-explanatory, in different elements of form of life. The influence of time can easily be seen in the case of socio-cultural and even psychological elements. For example, the forms of life were very much different in the 1950's from what they are today. Nowadays people have better economic backgrounds, they are more educated and people's wellbeing and health is better than 50 years ago. However, biologically people have remained the same. Thus, on a temporal level, from the evolutional point of

view, we do not change quickly biologically. However, on an individual level, there is a temporal dimension in our physiological form of life. Becoming old affects everyone in the end of our life and ageing can thus be seen as a temporal dimension of an individual's life. In the past it was thought evident that ageing affected the same way every individual, because people's lifestyles and backgrounds were more or less the same. Nowadays, however, getting old has become an individual element of our life: we cannot say that all 70-year-old people have the same physical condition. In fact, there are significant differences between people within the same age group. We can have 70-year-old people who suffer from different illnesses and are fragile because of this and very much dependent on other people's help. On the other hand, we know 70-year-old people who are still healthy, active and retain significant roles in the society. Ageing is nowadays an individual process, and the temporal dimension that can be found in it is within the individual perspective.

Finally, someone might argue that the notion of form of life is somewhat non-specific. Actually, to a certain degree, both the form of life as all the other related concepts that I have introduced in the previous chapter are non-specific. None of these concepts can be specified with one single factor that would transmit all the other elements. However, there is no other notion that would cover all the elements of human everyday life, including the biological one. This is why I find the form of life as a very suitable human-driven notion for examining the interaction between the human being and technology.

In the following, I will systematically examine the biological, psychological and socio-cultural preconditions for the forms of life. Technology in relation to forms of life is considered after this analysis.

4.3.2 Biological factors

Biological factors determine our forms of life and thus indirectly our relationship with technology in different ways. The most fundamental of them is our functional capacity. It is a concept that reflects mostly biological, but also psychological and socio-cultural aspect of our forms of life as it includes our physical, and also our psychological and social capacity. It is considered as an indicator for our personal health. Not only does it predict the years that we have left but indicates also the ability to cope with the basic activities of daily living and the support that is needed in carrying them out. (Heikkinen, 2002; Voutilainen and Vaarama, 2005.)

The World Health Organization (WHO 2002) has presented an International Classification of Functioning, Disability and Health (ICF) model of our functional capacity. This concept includes a medical and social model. The medical model measures our disabilities, which are caused by, e.g., diseases or our health condition. The social model interprets our disabilities caused by social factors in our environment. In this model, disability and functional capacity are defined as results of our health conditions and contextual factors. The contextual factors are divided further into external environmental factors – such as social attitudes, legal and social structures or climate – and to internal personal factors – such as gender, age, education – and other factors that influence how we experience disability. The ICF model describes our functions on three levels: 1) functions of a body part, 2) the whole person, and 3) the whole person in social context. Thus, changes of functional capacity can be manifested in health conditions and contextual factors.

Our physiological capacity, such as respiratory capacity, muscular strength, and cardiovascular output, increases in childhood and peaks in early adulthood, eventually followed by a decline. The rate of decline, however, is largely determined by factors related to adult lifestyle – such as smoking, alcohol consumption, levels of physical activity and diet – as well as external and environmental factors. From the biological side, our environment affects also our functional capacity, in other words, our living conditions have a significant influence to our functional capacity.

Physical capacity includes our possibilities to manage the basic activities of our daily living (ADL), such as walking, eating, taking care of the hygiene, sleeping and dressing. It also includes different instrumental activities of daily living (IADL). These IADL's include, for example, running different everyday errands at home and outside home, shopping, housework and meal preparation, taking care of bills, using the phone, and taking care of one's own medication. The concept of physical capacity includes also the person's state of health and possible disabilities s(he) might have. (Park et al., 1994; Tirrito, 2003; Voutilainen and Vaarama, 2005.)

Physical inactivity is related to many diseases such as certain types of cancer, hypertension, type 2 diabetes, cardiovascular diseases and osteoporosis (Strong et al., 2005; NNR 2004; Tirrito, 2003). Participation in regular, moderate physical activity can delay functional decline. It can reduce the onset of chronic diseases in both healthy and chronically ill people. For example, regular moderate physical activity reduces the risk of cardiac death by 20–25% among people

with established heart disease (Merz and Forrester, 1997). Exercise affects also glucose tolerance and has positive effects on hyperlipidemia and osteoporosis (Tirrito, 2003). Physical activity is also an important public health issue. During the last decades many structural changes in society have decreased physical activity in our daily lives and nowadays many people are physically inactive (NNR, 2004).

In addition to improved health, physical activity has been found to have an association with healthy dietary habits (Johnson et al., 1998) and it has been noted that changes in physical activities could also have the effect of improving dietary quality. Additionally, a Finnish study (Hassmén et al., 2000) indicates that physical activity has psychological benefits, and more physically active individuals experience less depression, anger, cynical distrust and stress. The results of Laforge et al. (1999) indicate that people who exercise regularly have higher self-perceived quality of life than individuals who are the least prepared to adopt exercise as part of their lifestyle.

The biological facts make, on their part, many rules in forms of life understandable. For example, young people are very motivated for forms of life the core of which is in finding a partner for life. Their biological state explains this and makes understandable many rules of such behaviour. Mere social explanations are not sufficient here. In this way we should empirically and theoretically investigate the biological preconditions for the forms of life.

4.3.3 Psychological capacity

Our psychological capacities influence in many ways our relationship with technology, as they include all the functionality needed in information processing, from observations to solutions for operations. These capacities consist of memory, perception, learning, linguistic functions, thinking and social cognition. Control over a psychological capacity is connected to a person's mental health and psychological well-being. It includes self-appreciation, mood, mental resources and managing different challenges (Ruoppila, 2002; Voutilainen and Vaarama, 2005). A distinguishing feature of psychological functioning is the way a person is related to her or his inner and outer reality, and how (s)he experiences his or her capability to affect these factors.

Personality, personal characteristics, emotional life and intellectual capacity change in the course of ageing. Peoples' ways of reacting to changes are versatile and complex. We talk about coping in life, i.e., the way an individual is able

to direct his or her own life, to experience the life as meaningful. The basic assumption of coping in life is that a human being is a goal-oriented person who fulfils her or his missions in life, as well as personal projects and ambitions throughout different phases of life. (Nurmi, 1993; Raitasalo, 1996.) Coping in life is, on one hand, an a strong protection against disturbances and disasters coming from outside world, and, on the other hand, a possibility and interest in changing one's life to desired directions (Roos, 1988).

Self-esteem tells if a person appreciates him or herself, and it is strongly connected to psychological well-being. Whereas self-efficacy (Bandura, 1977, 1997) expresses our own estimation of our possibilities to, for example, manage a certain task, self-esteem tells, roughly speaking, whether we like ourselves or not. Ageing doesn't as such lower self-esteem (Fukukawa et al., 2000; Ryff, 1989), on the contrary, self-esteem has been considered to be fairly flexible during the older age (Baltes and Smith, 1990).

Coping in life is not an innate capability, but it evolves through age and experiences in life. In general, coping in life is characterized by a sense of coherence and self-esteem. Sense of coherence reflects a person's general attitude on encountering burdening factors. According to Antonovsky (1979), people constantly need different kinds of resources. When these resources are sufficient for the individual's needs and the possibility to master their use is there, that person is able to achieve harmony, i.e. a sense of coherence. The concept refers to the kinds of resources that aren't dependent on a certain situation but which can be used in different kinds of situations. It is the person's inner resource that is based on manageability, meaningfulness and experiences of structure and comprehensibility. The sense of coherence expresses a person's inner ability to see existing possibilities around him or herself and make use of the best ones in respect to the demands. (Kalimo et al., 2002.)

Learning is a process, where experience is turned into knowledge, abilities, attitudes, values and beliefs. It is an ongoing process through which a person tries to perceive everyday experiences related to time, place, society and human relations. Learning is thus a process, through which an individual gives meaning to his or her experiences or attempts to understand them. There are three different processes in an individual's consciousness concerning acting and learning. These include 1) predicting and planning, 2) estimating the current and 3) looking backwards, evaluating the past. Evaluating the past and the future are significant from the point of view of learning, because only through them are we able to experience and develop. Looking back is the most essential factor. Stopping,

resting and thinking are essential factors for the development of individual humans and the human kind, as well. Unfortunately, one of the greatest hindrances of learning in today's society is constant haste. (Jarvis, 1992.)

Learning is a process that changes over time, and time is an essential factor connected to learning. As long as memorizing, knowledge and abilities gathered through an individual's experiences in life, is efficient, life seems to continue: its flow remains undisturbed without a person thinking too much about it. But when the storing of this knowledge starts becoming ineffective, and the individual doesn't seem to be able to respond to a new experience in a new situation, time itself seems to stop. It is a matter of "now" and "then" -situations. Experience is situated in a time-indexed storage. It is measured and contemplated, and its possibilities in the control of everyday life are evaluated. If the solution is successful for the individual and life can be expected to continue in a similar manner, then the process with which the experience was handled will be stored among other experiences in the biographical store of knowledge. When an individual reencounters a similar challenge or experience, (s)he reflects on what was learnt earlier in respect to this new experience, often without consciously thinking about it. Things learnt, which actually are memories, help the individual further. People learn from experiences to manage situations at hand, but also to respond in a similar way to similar experiences encountered later without having to process them again. (Jarvis, 1992.)

No individual experience is free from earlier experiences (Rauste-von Wright and von Wright, 1994). Earlier experiences affect the way an individual experiences a new event or thing. Through an experience the individual is able to perceive the constantly changing world around her or him.

Memory is a set of abilities which people possess and which enables them to learn from experience and retain what they learn (Roediger et al., 1998; Stuart-Hamilton, 2000). Many different types of memory have been discussed in literature. They vary according to the criteria applied for classification, such as time dependency, type of information remembered, and degree of consciousness of the remembered material. Traditionally, a distinction is made between short-term and long-term memory (Craik et al., 1995), although there is controversy about this dichotomy in the scientific discussion.

The memory process can be divided into three stages: encoding (original acquisition of information), storage (retaining information over time), and retrieval (gaining access to information when desired). According to different studies of memory, our subjective assessment of our memory seldom goes hand in hand

with objective assessments of our memory functions (Schmidt et al., 2001; Cook and Marsiske, 2006).

Procedural memory refers to the knowledge of how to do things, such as walking or riding a bicycle. *Declarative memory* is to know facts about the world and about one's past. It refers to the degree of consciousness about recollected material and the circumstances of learning it. Declarative memory can be contrasted with non-declarative memory, which refers to a type of memory where material is often used unconsciously for the execution of a task (e.g., riding a bike), and it is not necessary to recall how and when or where the material was learned (Squire, 1992). Declarative memory is divided into *episodic memory* (contextually bound remembering of episodes of our lives) and *semantic memory* (general knowledge of the word). *Short-term memory* refers to our ability to hold in mind a relatively small amount of information that is rapidly forgotten if we stop attending to it. This is also referred as *working memory*, because it permits us to perform the mental work of manipulating symbols and thinking, the processes used for temporarily storing and manipulating information. The term *long-term memory* is used to refer to retention of different information over long time periods.

Prospective memory works when an intentional action or series of actions is in question (Cohen, 1993). It includes the overall remembrance of the action, the remembrance of its execution and of when and where the action should be performed. In order to manage all our daily demands, the prospective memory is probably the most important aspect of our memory. We have to be able to remember settled meetings and perform all kinds of tasks, like taking medication, paying bills and making phone calls. Often we use all kinds of memory aids like calendars, alarm clocks and notepads to remember these tasks. In order to be able to remember what we are supposed to do next, we also have to be able to remember what we already have done. That is why the prospective memory needs to its side the retrospective memory. For example, we have to be able to remember having taken our medicine to avoid taking it anew. Although the prospective memory weakens due to ageing, many of us can compensate the weakening by linking the future task to other everyday routines that remind us of the task in question (Cohen, 1993).

Psychology, on its part, sheds also light to the forms of life and their systems of rules. Many technologies presuppose high level of skills. Experts and novices are different in using the same technologies. This is why their rules for technology usage may essentially differ. The explanation for this must be searched for

from the differences in the contents of the mental representations and earlier training. If we wish to improve novice performance we have to teach the novices the rules of a particular form of life. On this level, for example, forms of life are a psychological phenomenon and they must be investigated within the context of modern psychology.

4.3.4 Social and cultural factors

Social and cultural factors are perhaps the most visible but also the most multifaceted factors that influence human-technology interaction through different forms of life. We grow and develop inside a specific culture, and the conceptions, beliefs, schemas and contents of mind created by this particular culture adapt into our ways of perceiving reality. Our models for emotional life and social ways of action are all shaped by the culture. We become humans within our own culture, and due to this we will also have many cultural layers in our identity.

Our social and cultural capital is part of our forms of life. Thus our functioning as people is goal-oriented, intentional and shaped by social and cultural capital. We do things to achieve other things we pursue. We have many kinds of needs, hopes, cravings and dreams that move us and make us pursue even newer things (Garver, 1990).

Culture can be understood in many different ways. Firstly, it can be considered as the total of achievements in the fields of art and science, as spiritual cultivation. Secondly, it can be observed from a wider perspective as habits, customs and beliefs that are characteristic to a certain group of people. In this case culture is indirectly paralleled with the way of life, and it's a question of something stable, regular and independent of peoples' will. Thirdly, culture can be considered as a hierarchical system, where different ways of life are proportioned with each other. (Roos, 1988.)

Social capital includes different social networks (groups and organizations) and the goals, values and norms shared in these networks as well as the rights and responsibilities included in them. It includes social resources and a collective good benefiting every member of the community (Coleman 1990; Putnam 1993; Carroll, 2004). People who share the same social capital, i.e. the same understanding in a certain context, share the common form of life with common values, motives and expectations. These are learned by personal experience and the situation in life, but also determined by culture and society. In another context, people's values, e.g., could be different.

Cultural capital, the basis of which is in childhood, consists of different material factors such as music, art and literature, among other things, as well as habitus, which was discussed earlier. It also has institutionalized forms like theatres, schools and museums. Along with changes in the society, cultural forms can lose their significance. The cultural capital gained earlier in life can also grow qualitatively during the course of time, as is the case with wisdom, gained with age, and also with tacit knowledge created in everyday life.

Social capital has no material form but is comprised of non-material resources resulting from relationships between players who constitute the networks and influence the processes taking place on the different community levels of social cooperation. It is produced in interaction and communication between people, based on reciprocity and trust. Belonging to a group or having social ties in general are prerequisites for creating and having social capital. A group membership may require stronger or milder reciprocity. A good example of the former is in many cases family relations, and of the latter work-related social relations. (Molnár et al., 2008.)

There are two aspects concerning a person's social capacity: the person in his relations with others and the person as a social actor in different communities and societies (Heikkinen, 1994; Morrow-Howell et al., 2001; Atchley, 2000; Tirrito, 2003; Giddens, 2001). Our ability to function and be in social interaction with others includes, for example, relations with family and friends, the fluency of our social relations and participation, and also responsibility for our nearest and the meaning in life (Voutilainen and Vaarama, 2005). Social relations have an important role in our well-being. They determine our quality of life more than material factors (for example, money). The importance of social relations has further increased due to weakening of traditional family ties and to increasing number of people living alone.

The importance of many kinds of social support networks increases the older a person gets. The more social capital is incorporated by authorities and institutions, the more important is trust between the different parties. For example, the personnel of a home for senior citizens can unintentionally weaken the social capital of an elderly person by intruding into the area of private life too much.

'Community' is a broad concept with many aspects. According to Peters and Marshall (1996) it can include such factors as 1) community as a place (the geographic area of a tribe, village or city, the land of ancestors, borders and characteristics formed by nature), 2) community as a social political network (common interests, voluntary organizations, political organizations), 3) community as a local

organization (project or program oriented society), 4) community as a governmentally supported organized form of society, 5) community as a social structure (roles, status', social classes), 6) community as a state of mind ("we" and "our", feeling of togetherness), 7) community as a culture (cultural values and beliefs as a cornerstone for activities). (Peters and Marshall, 1996, pp. 37–38.)

The basic idea of communities is that a person cannot manage alone. Drawn to its extreme, this would mean that a person becomes significant only through other people. In practical everyday life this means that people cannot live just for themselves. People need their natural close environment. An individual lives with his or her friends, in a family or amongst relatives and spends time at work and hobbies or in occasional groups. From the fact that people need each other follows that an individual has, in addition to rights, also responsibilities. Communities reflect Kant's (1949) categorical imperative: another person can be only a goal but not a tool to reach the goals. A natural consequence of assuming that people can't survive alone is that something should be done for the benefit of other people.

Community and individualism have been in fashion in even turns. Peters and Marshall (1996) define 'individualism' and 'community in two ways. First, they emphasize the sovereignty of an individual or a family over society or state as a logical privilege. Second, they emphasize the hierarchical nature of values and thus the privilege of society over the rights of an individual. The latter is justified by the thought that an individual's rights and meaning can be only grounded on the basis of belonging to a society. (Peters and Marshall, 1996, p. 207.)

What about virtual communities? Can there be a community without propinquity? Gilleard and Higgs (2005) argue that also a symbolic community can be experienced as a real one. One of the most significant symbolic functions of communities is to create a sense of belonging amongst people, and it is possible to actualize this also in the absence of direct face-to-face social contacts. There are many examples of communities of identity which express some level of belongingness and provide a particular meaning to what it is to be, e.g., Green, gay, Christian, deaf, or vegetarian. Gilleard and Higgs claim that communities of interest seek to constitute only a part of the life world, one element in an individual's social identity, without placing demands or raising questions about other roles and other relationships. For example, football supporters offer a good example of these. For those supporters who, for one reason or another, cannot make their way to their "own" team's stadium, the living room sofa offers an

alternative to participate with a community of imagined supporters. For a while the virtual community is experienced as real.

As indicated earlier, a form of life can be understood in the relation to its context. Context, on the other hand, is closely related to *tradition*, which in turn is a relatively stable way of regarding different contexts. Traditions include beliefs and "old wives' tales" connected to the lives of people in the community. Whereas tradition is something quite unchangeable, context may change relatively fast and incidentally. On the other hand, no community can remain in an invariant situation all the time. All communities change, slowly or more rapidly. To apply tradition into a certain context, one needs reflection. Tradition can formulate context with the help of reflection. In this sense, context is never a purely material or objective environment but always a construed operational environment.

During the course of time the different elements of our form of life change. From the technology point of view, the forms of life have changed during the last decades substantially due to the significant development of technology. Washing machines, electric stoves and baking machines have changed the form of life of families, as the services of household servants are not so much needed, any more. Technology takes care of a significant part of the workload of household management. Also, the development of radio and TV technologies has brought totally new possibilities for being aware of the events locally and globally. Information technology has also changed our interaction modes: many of us cannot write properly any more, and writing in a traditional way with a pen and paper is likely to be vanishing as a mode of everyday interaction.

Forms of life are mostly socially shared. This is why social sciences are needed to explicate the rules structures. They are also needed to analyse why some particular systems of rules make sense in social terms. Of course, this is not all there is to know about forms of life – just the essential in our attempts to understand these basic phenomena of life.

4.3.5 Norms, values and attitudes

Forms of life must be studied in a multidisciplinary manner. Let's think, for example, such typical rule types as norms, values and attitudes. Norms and values direct our everyday life and have thus a remarkable role in human-technology interaction design. They are contents of mind which direct our goals and our activities. For example, if hedonism is a core value of a person, the content of mind is the ambition to gain pleasure in everything this person does.

Thus, the content of mind directs the activity of the person and the goal for the activity manifests itself as a content of mind. In this sense the contents of our values define our activity.

From a sociological and ethical point of view, norms are detailed regulations enabling our social functioning and determining what is allowed and what is not, what one should do and what one should not. Our society constantly produces norms and regulations that people obey more or less voluntarily. The justification of these regulations, i.e. what the rules should be like, is studied in the field of Ethics.

In addition to norms, our behaviour is also regulated by internalized or externally set values that we pursue or ought to pursue in our actions. (Puohiniemi, 2002; Rokeach, 1979; Schwartz, 1992; Kotkavirta and Nyyssönen, 1996.) From a socio-cultural point of view, values are culturally predominant perceptions of individuals', society's and human kind's central goals of a good life, good society and good world. They are objectives directing a person's life and they operate as guidelines in decision making (Rokeach, 1979; Schwartz, 1992; Schwartz et al., 2001). Besides individual and cultural values there are also critical universal values that transcend culture, such as human rights.

The values that we experience and follow in our life can be intended, practical or moral. They can be individual or shared by the community. For example, different groups and social networks that we participate in also determine, from their side, our values. In this sense the values of motorbike club members and thus their form of life may differ a lot from the form of life of nature activists, although people belonging to these groups may share the same values in another context.

As pointed out, values can be moral or non-moral. Ethics is concerned with the justification of moral norms. By moral we understand people's selective behaviour based on values, and the beliefs and contract systems related to this behaviour, as well as norms concerning good and evil, right and wrong, valuable and worthless, acceptance and rejection. Moral thus connects a person with the world of values and with other people. Moral includes also those perceptions of good and evil as well as right and wrong of an individuals and a society which are culture-bound. Morals require that people internalize these perceptions – whether they be borrowed, inherited or derived by oneself. Moral is created when we as agents have to consider the impact of our actions on our nearest and on the whole human kind. (Lindqvist, 2002).

According to Rokeach's (1979) value theory, values form relatively stable systems, in which each value has its place in relation to other values. Some of the values are "given" to us, through education, others we choose ourselves on the grounds of our life experience (Mackie, 2007). Values conduct our lives by affecting personal goals and choices. They are created at the verge of adulthood and change throughout life. The values of different sexes and generations often differ.

There is a fundamental tension between different values, which can be seen in many cultures (Puohiniemi, 2002). This is between two different dimensions, namely between new and old as well as between emphasizing the self and considering others. If we continuously look for something new it will be impossible to preserve the old. Also, if the self is strongly emphasized it is not be possible to consider others. (Puohiniemi, 2002.)

People perceive value relationships in three ways. Firstly, certain values are perceived conflicting, such as for example daring and safety of the family. If one heads towards everything new ambitiously, one cannot necessarily guarantee the safety of the family. Secondly, some values are perceived as complementary, such as humbleness and moderation. Thirdly, certain values are perceived independent from each other, such as curiosity and wealth. A person may value wealth more than anything else, but from this it is impossible to say whether curiosity is a core value to that person. (Puohiniemi, 2002.)

Values and their alterations are connected to zeitgeist, which, as a whole determines how we see the world, and it is transmitted to us, among other things, through everyday experiences, media and advertisements. Attitudes in turn are ways of reacting to the world around us and, for example, influence how we as users react to new services (Saariluoma, 2004). These positive, neutral or negative tendencies of activity affect our decisions of how to act in different situations (Ajzen and Fishbein, 1980). Attitudes toward products are learned through direct experience or from secondary sources such as advertisements or word-of-mouth. Attitude is general by nature and is not tied to any particular behaviour. It is a one-dimensional evaluation from favourable to unfavourable. Some attitude models consider affect as a major component of attitude (Fishbein and Ajzen, 1975), while some suggest that attitude is influenced equally by beliefs and affect (Batra and Ahtola, 1990; Keinonen, 1998.)

Compared to zeitgeist and attitudes, the role of values in the mental system of an individual is central, deeper and more acknowledged. Values are motives that exceed individual situations. They are goals that are set in order of importance and direct our choices and estimations. (Ilmarinen, 2006.)

Von Wright (2001) divides values into six different basic categories of good. A similar kind of division was presented already by Aristotle. The first basic category is *instrumental* good. Many tools, for example, have some kind of instrumental value. The other category is *technically* good. It is related to technical abilities like, for example, fishing, sawing or playing an instrument. The third category is *health-related* good, and it is, for example, related with taking care of one's physical health. The fourth category is *utilitarian* good, a factor that benefits as large portion of population as possible in terms of general benefit. For instance, the Nordic social and healthcare service system can be considered as an example of this type of utilitarian good. The fifth category of good is *hedonistically* good, connected with enjoyable life and pleasures, such as good food, good wine and music or a fascinating movie or novel. The sixth basic category of good is *morally* good, i.e. good in itself. Morally virtuous actions are good without expectations of a reward. Doing something good to others altruistically is morally valuable.

From a psychological point of view, attitudes and values play a significant role in becoming conscious of the reality, in receiving information and in decision making. This is why they have a central position in human-technology interaction design, also. From the point of view of design, attitudes are an important factor in explaining human action, because they change relatively slowly and create extensive systems. By knowing these systems it would be possible to predict some behaviour patterns of people quite reliably. Attitudes become active automatically, direct our activity, alter and change. An attitude is often a system of beliefs, connected to emotional models, which becomes active as a part of the perceiving process. It directs information gathering in such a way that people reject information that is in contradiction with their attitudes and pick up information that is in tune with their attitudes. Because of this, considering attitudes is important when analyzing people as users of technology. They reveal, for example, how people react to new services or how trustworthy they consider certain product deliverers.

As can be seen, norms, values and attitudes can all be investigated from psychological, sociological, ethical and philosophical perspectives. The core concepts in understanding them can thus also be opened up with the help of these disciplines.

4.4 Technology and forms of life

4.4.1 Technology, meaning and everyday life

Characteristic to ICT technology is the fact that it extends to all sectors of our life, covering our work and leisure time as well as our private and social life. It has become an essential part of our everyday life and has penetrated everyday things we live with. We experience technology on a socio-cultural, psychological, as well as biological level. This way the three elements of form of life become visible also in our relation with technology.

To most people, on a biological and socio-cultural level, ICT technology has given the present quality of life potential. The development of ICT technology has offered several enhancements, such as better health services, better work conditions and freedom from work, possibilities to creativity and belonging in different communities. ICT technology has offered better access to and management of information, improved decision making, and improved communications. For computer literate people who can use ICT technology and learn new sophisticated systems, ICT technology has provided many opportunities for personal growth, such as personal empowerment due to home computers, which provide personal leverage in acquiring and organizing information. Further, office automation and information systems technology allows people to operate at a much higher level of both creativity and productivity. ICT technology has provided possibilities for creating and maintaining social relationships. It has provided relief from boredom, and the greater amount of information available satisfies cognitive hunger and makes individuals aware of much wider range of choices (Artz, 1996).

Technology becomes meaningful through personal and individual symbolic values as well as through social relationships in a person's life. The meanings can be intrinsic or extrinsic. Intrinsic meaning refers to the value of an event for the person engaged in it, whereas extrinsic meaning is meaning put to use for a purpose outside the immediate experience of the person engaged in an event (McCarthy and Wright, 2004). Thus, people differ in their attitudes towards modern technology. Whilst some may enthusiastically embrace technology and enjoy seeing technology in their environment, others may appreciate the benefits of technology but may not enjoy technology per se. For example, playing a computer game or watching a music video can be experienced as enjoyable as such without any major beneficial goals. Also, technology can become meaning-

ful through an aesthetical experience. In extrinsic meaning, however, understanding and interpretation of the benefit that technology brings become more important than the immediate experience. For example, in the case of a ticket vending machine, the outcome of the usage of the device, e.g., receiving a train ticket, becomes more important than the bare usage of the system.

Technology gets its meaning in the context of our everyday life. We follow the rules of the adopted forms of life to reach our goals, and the technologies we use are meaningful by helping us to reach the goals. They enable us to get forward in life easier, and often they even make it possible for us to carry out things that otherwise would be impossible. This meaningfulness is important from Wittgenstein's point of view. He argued that words get their meaning when we follow the rules of a language and language games. Language games in turn get their justification in forms of life. So, technology gets its meaning in the same way as language. Is this strange? Not at least for Wittgenstein, who compared language and words to tools. From this point of view, the important thing is that forms of life define uses and meanings of technologies. This gives a hint that indeed understanding the rules of a particular form of life might be used in the design of technology.

Considering different forms of life, technology, such as the Internet, may enhance, for example, the feeling of belonging to a certain group or to a certain geographical or virtual space. It may also enhance the feeling of competence and self-efficacy of people and promote coping in life and feeling of security. It can facilitate people's possibilities to influence decision making processes through participation, creativity and communities. As an example, the mobile phone can become meaningful through many kinds of experiences. It can create the sense of belonging to a group through a shared symbolic language of text messaging, through individual ringing tones between friends, and through the content of sensual messages kept in the phone and flipped through long after their receival. This same device can also bring the feeling of security when carried along all the time, and no doubt can also serve as a means for expressing one's economical status and can also be used to raise it in other people's eyes.

The mobile phone itself can even become the centre of activity, a fetish (Fortunati, 2005). Hjorth, (2005) who studied the personalisation of the mobile phone in an Australian sample group, sees sending of text and multimedia messages as crucial to the maintenance of personal social connections. At the centre of this activity is the mobile phone itself, both as a machine for sending messages, and as an artefact that displays a message about the individual users via

the personalisation choices they have made. Hjorth documents how the users in her study, by choosing screensavers, ringtones and faceplates for their phone are able to manage the display of their own identity. Based on her studies she argues that gender and identity are not innate but are constantly practised, rehearsed and expressed in everyday life and that technology can provide a means for that. In the case of the mobile phone, personalisation is seen as an extension of this performative acting of gender and identity, the phone taking on the practised identity of the individual and, through its broadcast of these individual identities via faceplates and ringtones, disseminating this information into the immediate social environment of the user.

In this sense, technologies in different forms of life have started to gain totally new meanings and people even seem to become emotionally attached to them (Vincent, 2005). The meaning for their existence has changed in many cases, also. For example, dishwashers, telephones, TV's and even computers were, in the very beginning of their existence, nice things to have. They were signs of social and economic status. Today, however, access to a telephone, for example, might be seen as a minimum requirement for social networking and considered as a basic need in people's lives. In this way a "nice-to-have product" has moved, over a period of time, from being an object of social appreciation to being a basic need in everyday life. The mobile, for example, has become an integral part of many people's forms of life. Not has it only been adapted into the ways of life of the users, but also the way of life itself has changed through the diverse usage of this device.

The implications for increasing practices associated with ICT technology and especially mobile technology may in the future be even more significant than we can assume. Novel forms of widespread mediated communication, especially, could alter cultural values and transform social structure and interpersonal processes in totally new and unpredictable ways. An example of this is the meaning given to the mobile phone as a representative of the self that can transmit a sense of will. This is the case in Asian cultures, according to Katz (2005), where mobile phones are nowadays being used, among many other things, as sacrificial gifts for those beyond the grave. Boxes of sacrificial offerings to the dead, including items supposedly needed in the afterlife, are made commercially in certain Asian countries. Now some of them include mobile phones. Katz explains that, for example, in Hong Kong they are cardboard ones, whereas in Japan mobile phone toys have been left at religious statues of shrines, and even a statue of Hindu god holding a mobile in one of the many arms has been created and mer-

chandized. According to Katz, this is not an alien phenomenon in Europe, either. For example in Italy, mobile phones were placed as memorial offerings on the tombstone of a young Italian girl killed by the Mafia (Katz, 2005).

4.4.2 Technology modifies existing forms of life

Technology affects our behaviour and attitudes, as well as the way we experience ourselves and our fellows. In addition to the fact that technology around us shapes the way we think and act, we as users also modify and alter the way of using technology. We do this on the basis of our forms of life and our experiences, and as a result of this may create even totally new meanings to the usage of different technologies. Mobile phone technology is a good example of this. It has changed people's attitudes towards phones. Mobile phone is a highly personal device, perhaps more personal than any other device. The owner of the phone has a personal number and a personal device with personal tone rings. Hulme and Peters (2002) even argue that users consider the mobile phone as an extension of the self. Accordingly, the loss of a mobile phone is felt not just as a loss of an artefact but also sensed on the level of one's physical self. Indeed, when leaving home without the mobile many of us might feel that something is missing. So, in a sense, as users of technology we have come a long way from the state where people were considered only as extensions of machines. The artefact now, at least in the case of the mobile, is considered as an extension to the human.

Mobile technology has brought numerous social and cultural effects in the life of people. Before mobile phones, social identities were generally based on certain locations and depended largely on the specific environment in which the individual was placed and also on whom s(he) was with (Hulme and Truch, 2005). When at home, we maintained the social identity of a parent or spouse, and at work, we maintained the social identity of an employee and a colleague. Each of our roles and social identities was closely linked with the surrounding physical environment and the co-located company. To a certain extent, the fixed telephone already began to change this, but still it was clear to the caller and to the individuals themselves, which social identity they were maintaining at that moment in time. When using a mobile phone, however, it is not immediately obvious to the caller where the individual is located at the time of the call. Equally, the individual does not know which of her or his social identities is being sought, as anyone from any area of life can contact the person via mobile

phone at any time. Hulme and Truch explain that at the same time as the boundaries of the environments have become fluid, social identity boundaries have also become much more flexible. The mobile phone provides a means of creating and maintaining these boundaries.

This flexibility in social identity boundaries cannot always be seen as a positive phenomenon. Hulme and Truch (2005) argue that the uncertainty that accompanies this flexibility can cause tremendous stress for the individual and those around her or him. With the 'anytime, anyplace' nature of the phone it is impossible to predict which social identity will be required with the next incoming call. Also, disparity between the 'on' and 'off the phone' behaviour may cause difficulties for co-located people who generally have a unitary image of this specific person.

An interesting aspect of the mobile phone and social relationships is the one pointed out by Geser (2005). He argues that mobile phone urges us to evade unfamiliar contacts offering an easy escape route from unfamiliar public encounters and from complex multilateral situations. The phone offers an immediate means of selecting and contacting people we like, increasing thus the extent to which social life is filled out with the most simple of relationships: bilateral interaction.

One example of the influence of technology in our forms of life can be taken from Hulme and Truch (2005). They have studied the transformation of 'interspace' from a mere transition zone to an environment in which complex processes concerned with the maintenance, structuring and re-structuring of social fields take place. 'Interspace' has initially been used to refer to the period, a transit zone', that occurs between two separate but related events which are specifically located in space and time (Hulme and Truch, 2005, 137). This can include, e.g., the time spent for travelling between two events, or between the arrangement of a meeting and the meeting itself. There are three main event environments in people's everyday life, namely work, home and social environments. According to Hulme and Truch (2005), the mobile phone has changed the nature of interspace by allowing communication with other non-present people whilst in transit, and thus the time zone of interspace has become increasingly populated. In interspace people can have many roles at the same time due to mobile phone calls from people from different contexts. The layout of activities and the roles with which they are associated has become overlapping and unpredictable, and simultaneity in roles has replaced linearity.

Glotz et al. (2005) argue that mobile phone, most of all, is coming to be associated with *presence*. With fixed-line telephone we perceived calling to a place, whereas with mobile telephony we call a person, increasingly expecting the person to be on the other end of the line. Thus, the technology has changed our way of thinking concerning the whole concept of phone call. With the accessibility offered by the mobile technology the person is always present. This means that (s)he is present as an employee all the time also. Mobile technology has thus given a possibility to control people. Also, it has changed the way of perceiving time and organizing things in terms of supporting extempore appointments and ad hoc meetings. Mobile telephony is likely to decrease time-based scheduling while spontaneous, unpredictable patterns of social life will re-emerge. According to Geser (2005) long-term evolutionary trends toward planning, scheduling and temporal discipline come to a halt, giving way to spontaneous, ad-hoc coordination according to current whims and circumstances. Social life therefore becomes more unpredictable, and more complex forms of social cooperation may become more difficult to create and maintain. Geser even predicts that mobile phones will undermine the traditional mechanisms that have secured segregation between different social systems and support the maintenance of highly pervasive social roles that bind individuals wholly into particular groups, communities or occupational functions. This diminishes also one's capacity of keeping a separate private life.

This new way of thinking has collapsed people's traditional forms of life in a sense that being available all the time means also opening up your private life to public arenas. The mobile phone is prone to increase the pervasiveness of the most intimate personal relationships in individual life, as anytime and anywhere we can contact our loved ones. However, people are not used to listen to other's private issues in public spaces, such as busses or shopping centres, and feel uncomfortable if someone's phone rings, for example, in a church. This has lead into a demand for mobile phone off–areas in the society (Kopomaa, 2000). These off-areas include different areas and places. In Kopomaa's classification these include firstly, socially shared and focused interaction situations, such as church services, concerts, theatre, and public speech situations. Secondly, these areas include "consecrated places" such as libraries and dining restaurants where restraining oneself from speaking with a high voice belongs to the nature of the place. Thirdly, these areas include risk exposure places and situations, such as aeroplanes, hospitals, gas stations, and motoring. Geser (2005) argues that in the Western societies, the unrestricted public usage of mobile phones is more suited

to lower-class culture than to middle- and higher –class settings, and that the intrusive effects of mobile phone calls are much better tolerated in proletarian restaurants than in higher-class dining rooms. He even claims that considering its affinity with a lower-class culture, the mobile phone could well become a 'negative status symbol' in the future, so that its explicit non-use or even conspicuous absence would increasingly become an indicator of a positive social distinction.

4.4.3 Technology creates new forms of life

It has long been known that technological development changes human social life. Domestication of animals, invention of the plough, steam engine, telegraph, radio, nuclear technology, computers and mobile technologies have all changed essentially the way people spend their lives (Fichman, 1992). Technologies have made things possible for people, but people also have to find respective social forms of living. The shift from agricultural society to modern industrial one did not happen in a smooth and easy manner. It had many social consequences, which deeply changed the forms of life for people. (Saariluoma and Leikas, submitted.)

Technology can contribute to the creation of new forms of life. Applied artificial intelligence and decision making systems, information networks and mobile technology are altering what we do, and how and when we do it. For example, ICT has changed working life with the development of information networks and especially wireless and mobile technology. Intranets of companies enable distributed and global operations, and mobile devices and the supporting infrastructure enable mobile work. E-work is becoming more and more popular, including mobile work, remote work and home-based work. The work is done increasingly in global network-like communities and teams. Work can be taken with the employee anywhere and the person can be connected to it from almost anywhere. The workplace is more and more often the whole world, and customers, partners, producers and competitors can be in any corners of the global village. Accordingly, the concept of working time has changed as global networks operate around the clock.

Mobile technology has had its influence on creating a new version of the old nomadic form of life. Thanks to mobile technology people have become to appreciate nomadic lifestyle. Kopomaa (2000) talks about the influence of the mobile phone in people's lives in terms of offering a "third place" between the home and the work place. The device is carried along all the time, and most peo-

ple feel that they have to answer the phone whenever it rings. In a sense the mobile has made life more efficient, as instead of the traditional ways of killing time, waiting in queues at offices or airports – time ordinarily considered wasted –, time is now spent in talking with others on the phone. All in all, mobile phone is a central part of new forms of nomadic life, and also is, in itself, creating new forms of life. The personal phone supports personal life styles, and has created a new kind of digital neighbourhood amongst people (Kopomaa, 2000). Together with e-mail and the Internet, it will probably become one of the most dominant devices ever created by the information and communication technologies.

Communication technology is affecting people's understanding and use of time. It responds to the need of nomadic lifestyle, where one has to be available while keeping mobile, and it enhances one's mobility at the same time. According to Kopomaa, the mobile phone is, at the same time, an instrument that allows mobility and an instrument that promotes it. It entices people into mobile phone partnerships and maintains these relationships. Carrying a mobile phone tells other people that the person wants to be available and is ready to be in touch. In this way, though the phone increases the possibility to be on the move, it actually at the same time increases the feeling of "being at home" all the time. It catches and connects family members who are on the move outside home. Bell (2005) discusses how the mobile phone is used in Asia specifically for social interaction between family members, not only in maintaining hierarchies but also to provide a sense of security. Mobile phones are bought for children not only for communication, but also as a form of a game that parents perform with their children, whereby the phone provides a constant link between the parent and the child and reassures parents of their child's safety and security.

The social change due to freedom from place and time is the very issue that mobile technology has brought to many developing countries, also. For example, in Rwanda, the mobile phone is an expensive and treasured item, used mainly by individual small businessmen and women. It has the power to expand the horizons of their business and open up their workplace and work schedule, allowing them to organize their work effectively in a way previously unthinkable (Donner, 2005).

Unfortunately, it seems that technology may also produce wholly negative forms of life. For example, the development of entertainment technology has been claimed to have a connection to children's obesity. The ever increasing time spent in front of the Internet or a computer game, changes eating habits increasing the amount of snacks and unhealthy food consumed. Another exam-

ple of the influence of technology is television, with its twofold contribution to people's quality of life. For most Western people, the television represents the main "window to the world" being an intermediary between the private world of home and the wider public, the national and international community. It provides factual information about the world and a person's environment, and promotes social inclusion as well. Although this medium invades the private sphere of individuals with commercials or other messages that serve the interest of enterprises or collective entities that are not usually part of one's daily life, there are television programs that do indeed enrich people and by doing so improve their quality of life. However, Artz (1996) argues that goals that cannot be pursued are also often created by television. He claims that, instead of encouraging and helping people identify their own personal goals based on their individual strengths and weaknesses, it encourages people to live vicariously through various actors and actresses. So, television interferes with our pursuit of quality of life, first, by interfering with our goal structure and then by providing goals which are not conducive to providing optimal experiences. Also, television, the Internet and computer games provide pleasure without enjoyment. The pleasurable distraction when watching TV or playing a game does not result in a more complex self. Any happiness produced by them exists only when the device is turned on. As soon as it is turned off the user is no more equipped to deal with the world than (s)he was when (s)he started to watch TV or play the game.

An interesting phenomenon is that technology does not only contribute to creating new forms of life but also connects people with different forms of life. For example, in services of new media, such as internet communities, people of different ages and of different cultures can meet and learn from each other. Of course, these communities as such can be seen as a new form of life.

4.4.4 Undesirable effects of technology on existing forms of life

Although many positive effects of technology on people's forms of life can be distinguished, ICT technology has no doubt brought negative effects on them, as well. Firstly, the development of information and communication technology is leading to a divided society creating a digital divide between technological haves and have-nots. The socio-cultural reasons for not using new technological products or services include ignorance of the services offered in the society, inability to use the services because of lack of education and training, and reluctance to acquire or try new technologies. For example, the commonly used types of inter-

action (e.g., the Internet, digital TV and mobile devices) can be beyond the competence and thus out of reach of some groups of people. For some people the operation logics of new technological solutions are totally new and thus incomprehensible. Also, people may not be able to access or are unaware of the services offered through technology. In some cases people are also reluctant to invest their time and effort in trying to learn the use of new technologies, especially if they already have had bad experiences in using different products or services.

According to Artz (1996), on a social level the impact of ICT technology can be assessed in terms of three factors: 1) how information technology impacts personal goals, 2) the extent to which information technology contributes to order or disorder in conscious energy and 3) the extent to which information technology provides opportunities for personal growth and development.

The rapid development of diverse technologies has exposed many ethical dilemmas, the solutions for which, in many cases, are already beyond reach, due to decisions that have had an irreversible influence on social and economical systems in societies. As an example, along with the development of different monitoring systems or large databases with private information, there is a danger that autonomy and personal privacy of people can be violated due to unreliable technology and complex systems which make it difficult to assign or accept responsibility. Also, information overflow creates techno-stress, a disease of adaption caused by an inability to cope with the new computer technologies in a healthy manner. Furthermore, ICT technologies may diminish our quality of life by providing us with a means of distracting ourselves with seemingly random pieces of information that inhibit us from organizing our conscious energy into more stable and complex patterns of adapted behaviour (Artz, 1996). For example, although the role of the mobile phone as a means for getting help in everyday decisions is easily understood in the case of, e.g., children or mentally retarded people, also the strong tendency by its users to become dependent upon it has already been recognised. It has been argued that mobile phones seem to fragment and isolate the self and reduce people's self-reliance, which in turn diminishes their ability to react adaptively to unpredictable encounters. Geser (2004), for instance, claims that mobile phones can undermine the development of particular social competences due to constant availability of other people with opinions and advice. Mobile phones enable people to retain these primary social relationships over distance. This affects people's self-reliance, making them unable to operate alone and leaving them dependent on the mobile as a source of

assistance and advice. This can often be seen, e.g., in shops, where people use their mobiles to ask what to buy.

So, in many areas of technology design ethical issues concerning the impacts of the design have been left without consideration. In a broad sense, ethics should be applied in the issues concerning what kind of technologies people wish to have in their everyday life, if any, and why.

4.4.5 Summary

Human actions are often regular and connected to each other in specific systems such as following sports or gardening. Any system of regular patterns of actions may be called a form of life. The rules and regularities of forms of life can be divided into three types. The first type consists of legal rules or social norms, the second type of conscious ways of acting and the third type of unconscious tacit regularities in behaviour. Form of life is not always a voluntary choice. An individual does not usually choose the form of life but is "thrown" into it.

There are an unlimited number of forms of life around human beings. Through participation in many forms of life an individual creates the regularities which (s)he follows in life. These are presented in the mind of the individual and followed in different actions. They create sense and order in the ways of action, and without them the actions would be random and irrational. The preconditions that are prerequisites for the emergence of a particular form of life arise from biological, socio-cultural and psychological factors. Some of them are more or less 'chosen' by the individual and may be dynamic in nature, whereas some are 'given' by genetics or living conditions, and thus constitute stable factors of the holistic form of life.

Technology gets its meaning in the context of our everyday life. We follow the rules of the adopted forms of life to reach our goals, and the technologies we use are meaningful by helping us to reach the goals. They enable us to get forward in life easier, and often they even make it possible for us to carry out things that otherwise would be impossible. Technology has also influenced forms of life in many different ways. These influences have been positive as well as negative ones and they have modified the existing forms of life accordingly. The meaning of technology in people's everyday life is ambiguous, and powerful enough even to create new forms of life.

Form of life is a concept with a multidimensional structure. Because of this it also has to be examined from a multidisciplinary perspective, i.e., through the

core concepts of different disciplines such as psychology, sociology, biology and ethics. Precisely for this reason I shall argue that the notion of form of life enables us to integrate these different ways of thinking in technology design. However, before it is possible to proceed any further in the theoretical discussions it is essential to look at different elements of forms of life from an empirical point of view. This will be carried out in the next chapter with the focus on older adults.

To take a critical stance, one may argue that form of life is an elusive concept. However, this is the very power of this concept. Like all the basic concepts of science, the meaning of form of life is defined in its use. This is also what Wittgenstein meant. Therefore, this notion can give us a possibility to cope with a very complex world around us. Íf we take such a notion as industrial quality, we can hardly say that it has one absolutely defined contents and meaning. Nevertheless, it calls attention to important issues in developing human-technology interaction. If we had no idea of quality we would produce technology of a poor standard. Similarly, when we turn our attention from our own intuitions to systematic analysis of the forms of life, which justify technologies and their development, we shall be able to analyse and understand much more about the role of particular technologies in human life and about how these technologies should be used. We can also consider such questions as what is the role and functions of existing technologies in the forms of life we study or why people are left out of the benefits of technologies as a consequence of their form of life. Indeed, the very notion of form of life enables us to ground our design thinking to people and to the way they live.

Investigation of older people’s life and designing for older adults provides a good example of how to examine concrete design issues with the help of the analysis of the forms of life. This will be introduced in the next chapter.

5. Testing and developing the core concept – older adults' forms of life

In this chapter I will examine the elements of forms of life of older adults as they are presented in biological, psychological and socio-cultural discussions. Before this, I will first discuss how these elements relate to the concept of form of life. Finally in the end of this chapter I will discuss briefly how form of life can be organised in the scientific tradition.

5.1 Constructing descriptions of forms of life

5.1.1 Rules and actions

In this chapter, I will refer to some main aspects of what we know about older adults' life. The presentation is concerned all the three defining fields: biological, psychological and socio-cultural. My intention is to get a good overview about the nature of the data we have about older adults' lives in general. This kind of material always consists of the basic data that we have about any type of human beings involved in any form of life. For example, if we are interested in senior soccer enthusiasts and their form of life, we first have to have an idea about their general human characteristics in these three dimensions of human life. This means gathering the existing scientific knowledge about the groups characterized by this form of life. After this we can be ready to take the decisive step and begin to construct a description of a particular form of life.

The descriptions of forms of life must be constructed by studies of the scientific knowledge we have about the people who are supposed to participate in a particular form of life. In order to carry out this synthetic work, we obviously have to have certain concepts which could help us in this procedure. Thus, we

have to abstract the material about basic properties of the target group's form of life, such as older adult's, by dissecting the given scientific material.

It has been discussed before that a form of life is characterized by a system of integrated rules or regularities in action. These can be called *rule-following actions*. For example, school children's form of life can be defined by investigating what kinds of regular actions they undertake during a school day. They wake up, get washed, have breakfast, go to school, meet friends, participate in classes, carry out tasks, return home, and do homework. One can say that these regularities are rules that children follow when they participate in school children's form of life. They follow rules by acting in a regular manner. Therefore, clarifying what a particular form of life is means defining what kinds of rules people follow in that form of life.

The very reason of adopting this Wittgensteinian notion of rule-following actions is that it provides us with a generalising concept to cover all types of regular human actions. For example, daily activities, routines in our everyday life and habits are all examples of rule-following actions. Indeed, any kind of regular behaviour in human life can be seen as a rule-following action.

There are some difficult points in using Wittgenstein's concepts, which are mostly caused by the simplicity and elegance of those concepts. We do not need any other limiting information but a system of integrated behavioural regularities. It is possible that some of the forms of life are very extensive and some very small. Living in an army would be an example of an extensive form of life, as would also be taking care of a garden or being a medical patient, because a great many people share these forms of life. However, some forms of life may be very rare. For example, playing checkers or the Star of Africa in a club is a much more specific and less common form of life. However, all of these are examples of forms of life. A form of life is simply a system of integrated rule-following actions. When taken in this way the notion provides us with a great freedom to analyse what people do in their lives and why.

We need not make any other assumptions concerning the forms of life but that they are systems of rules that people follow. As mentioned, we need not assume that these rules are conscious. They may just as well be subconscious patterns of behaviour which people follow in their lives. Of course, many of them are conscious, and even formally regulated. It is also possible that a subconscious rule for some reason becomes conscious, such as a rule of grammar, and we begin to follow it consciously. It is also possible that we may take different actions to

follow the same rule. We may, for example, visit a supermarket every Saturday, but we need not visit the same supermarket every day.

It is also possible to think that certain forms of life are embedded into more extensive forms of life. Travelling, for instance, is a form of life that is common among retired people. It is thus an embedded form of life within the form of life of a retired person. Nevertheless, this is not an essential issue, because we normally work with one form of life at a time and thus, when working with a retired person's form of life, it is possible to entail the rules of travelling among the rules of the whole form of life of a retired person.

In order to construct a description of a form of life it is necessary to inspect the regularities that would explicate this particular form of life. In case of older people, we have to consider what the typical regularities in their forms of life are and how they are organized. When one can clearly see this point and the freedom it gives to creative thinking, it is easy to understand the practicality of the Wittgenstein's concept.

The rule-following actions form the key to connect forms of life with technology design. We need technologies to achieve our goals of action. This means that we have to describe accurately the rule-following actions, their goals and the way they have been carried out. With the help of these descriptions it would be possible to consider how technology could help in realizing these actions. For example, a problem in summer cottagers' form of life is that the cottage may remain unattended for a long time during winter, which increases the risk of burglary. To avoid this problem, it is possible to use a burglar alarm system. In this way, a simple problem in realizing a form of life can be solved by using technology. Of course, there are several different ways one could use technology to minimize this problem and thus improve this form of life.

Because forms of life are not bound to any particular ways of following rules, technology can gradually change the form of life. Not too long ago there was a time when many summer houses did not have electricity. Today, most of them are electrified, which has enabled people to spend winter days there, also. For a retired person, this change is essential, as it gives much more freedom for following the traditional patterns of this form of life.

A close reading of the data of older people's life reveals that there are many typical ways for older people of today to spend time. Older people go for different daily errands, attend cultural events, pay visits to friends and relatives, take care of their own wellbeing and health, get medical advice, spend time at a holiday house, and enjoy travelling, for example. (Leikas and Saariluoma, 2008b).

All these ways of spending time can be seen as forms of life. This means that life is characterized by different types of forms of life which in turn are characterized by different types of rule-following actions. These actions are typical to a particular form of life. People participate in forms of life by undertaking actions which enable them to follow the rules. All these actions can be supported and enhanced with the help of technology, and thus the knowledge of actions can be used to design new technologies for the forms of life.

For example, one type of a form of life is defined by spending time in a summer house. Visiting a summer house presupposes different actions, such as refuelling, packing and unloading the car, driving to the destination, heating the cottage, sweeping the courtyard, fishing, preparing barbeque, asking friends to visit and spend time there and having sauna. Hence, the form of life of a summer cottager is characterized by quite different types of rule-following actions compared with that of a cultural traveller, for example. These facts become significant here in specifying these rule-following actions from the point of view of older adults.

5.1.2 Facts as attributes of forms of life

Form of life is not an unconditional phenomenon but has grounded arguments behind it. It is not sufficient to analyse and construct a form of life only by presenting the systems of rule-following actions. It is important also to see how the socio-cultural, psychological and biological facts modify them. Travelling, for example, is a different thing for a teenaged traveller in Europe compared to that for a retired person taking a city trip. On some level these people follow the same system of rules (of travelling), but the biological, psychological and socio-cultural differences make the travelling a different event for them.

I have already argued that *facts* concerning human beings are important in understanding life. A biological fact is, for example, a decline in physical functional ability. This means, for instance, that during the old age moving from one place to another is somewhat slower than during the young age, and that dexterity in hands and fingers is not that good any more, the vision is weakened although can be compensated with eyeglasses and memory may not function perfectly any more. A sociological fact is the increased amount of free time that a person has after retirement. Another fact is that as that person gets older the extent of social networks usually decreases. As a cultural fact, it is important to note that in many cases children of an old person live far away. Finally, a psy-

chological and biological fact is that older people need medication and medical advice to take care of their wellbeing.

As can be seen from these examples, facts are divided into biological, psychological and socio-cultural ones. As already pointed out, biological facts are essential in defining and understanding basic elements of a form of life. Psychological and socio-cultural facts are the ones that arise from the psychological and socio-cultural elements in people's life. These become visible by modifying accordingly the rule-following actions in forms of life.

Young travellers in Europe often have a minimal backpacking budget and they are anxious to find new friends, perhaps from the opposite gender. To save money, they are ready to sleep on the floors of trains and ships, stay in camping sites and youth hostels and eat cheap food. Many older European travellers could not, for biological reasons, live such a life. They need a better environment to sleep in order to, e.g., avoid health problems.

The older travellers in Europe usually have more money than do the young ones and can organize their travelling in a more practical manner from their point of view. In other words, their social conditions are different from those of the young travellers. Thus, the biological and social facts change the travelling style and in a way, the form of life of these two groups.

One can also find important psychological differences within these two groups. Young people are technically more skilled and they are able to reap much more benefits from ICT-technology. They can use the technology to get, e.g., information about travelling conditions. They can take advantage of online location maps and other available online services, while older travellers mostly rely on sending SMS messages and talking on the phone. Skills are, of course, psychological attributes of human beings (Ericsson, 2007).

This example shows how the facts of life, which have been referred above are important when we work to understand a specific form of life. We have to be able to define those facts of life which really modify forms of life. This helps us in designing interaction properties of technology. For example, old people may have impaired dexterity, a fact that should be taken into account in user interface design.

Facts of life are thus biological, psychological, and socio-cultural states of affairs, which influence the constitution of a form of life. Thus they explain phenomena associated with a form of life, and consequently we cannot think about forms of life in any depth without seriously analyzing the facts which are typical to a particular form of life. Facts as attributes give also a reason for why a form of life can provide a holistic and unifying perspective to interaction design.

5.1.3 Values as attributes of forms of life

Mere studying of rule-following actions and facts is not enough to direct the design of technology for the forms of life. People's *values* are also vital in this work. We need information about the values that, from their part, guide people's behaviour. Values have a social, philosophical, aesthetic and practical dimension, and must be considered from these points of view, which make them somewhat different in nature from facts of life.

Values as types of attributes that are different from facts, explicate individual or group goals, musts, obligations, conceptions of beauty and goodness in life. This is why they are often closely related to the selection processes that people carry out between different forms of life. Values can concern morals, i.e. things that are allowed or forbidden in rule-following actions and thus they direct and affect our behaviour, goal settings, choices and attitudes in life. Logically, technologies must be designed to support the accomplishment of the actions, i.e. things that are valuable.

In one sense values are expressed in 'worths'. They tell us what a technology adds to people's forms of life. Worths express how technology could modify and improve forms of life and the precise new value it would bring to people's life. Worth thus measures the value of the changes and also explicates the contents of these changes. An important thing here is that we have to inspect worths in the context of a form of life. The latter gives the contents to the former.

Values define goals for design and give different weighting, 'worth', to different design alternatives. They set different things in order of preference. Value does not rise as such from the design contents (like 'social contacts are important') but from the activity of people ('why social contacts are important'). Rule-following activities are not values themselves, but values determine the preferences among those activities. Although it may seem sometimes that people make choices also by chance, such as when they pop in to a shop while having a walk around, the values of people, conscious or subconscious, always influence their decisions. Values are meaningful within a specific form of life. For instance, praying towards Mecca is not meaningful for all people who pray, for Christians, for example, but knowing to which direction Mecca is, is a necessity to a praying Muslim due to his or her form of life. Based on their values people give different weightings to different goals of their activities. Thus the success in design, i.e. the value, depends on how well the design decisions succeed in serving different goals and different 'worths'.

Aesthetic value of a product is important as it effects emotional interaction positively. It is a form of value which improves the worth of a product. Beauty of a product is evidently important also in human life as it gives out social and symbolic signals about the person.

One aspect that brings added value, i.e., worth, to technology is ethical value. Ethical values are thus somewhat different from worths. They tell us what is valuable in our life, how we relate to others and how we should live to have a happy life. Thus, ethical values connect technology to the way we live and this means to the forms of life we participate in. In an ethical sense, it is important to choose between different forms of life one participates in whenever this is possible. Ethical value also tells how technology can negatively alter our forms of life.

The value of a product can also be analysed in a utilitarian sense: the good in product depends on the happiness or benefit that it brings, and producing the product is considered ethically right if it brings about the maximal benefit for the largest group of users. Utilitarianism is often felt purposeful in respect to new technologies. For example, the development of health care and medical technology can be seen to produce maximal value to a maximal number of people.

The issues of value are psychological and sociological. We can, for example, ask what the value characteristics to a certain form of life might be. This kind of analysis of attitudes, aesthetic experiences, prevailing moral values and codes forms an important part of empirical, sociological or psychological research on attitudes. This information is valuable, because when developing new technical solutions for a particular form of life it is important that the technology also fits and improves the value climate of a form of life.

However, there is also an additional perspective opened up by values which is not an empirical one. This is the question of what kind of technologies we should design for a form of life to improve its moral standards. A moral designer may put him or herself the question whether my work really promotes caring of other people? This means that one must ask questions about the human consequences of one's work (Bowen, 2009). Answering to questions of this kind presupposes also knowledge of the form of life.

We can now see that it is essential to analyse value issues associated with particular forms of life. They cannot be separated from the analysis of a form of life. They should not be separated from the rule-following actions either. Different viewpoints on value substantially deepen the analysis of life needed for technology design processes. In the following section, I shall discuss general knowledge about older adults' life and its preconditions to give the reader an idea

about the kind of knowledge we have today for constructing descriptions of forms of life.

5.2 Stable and dynamic regularities of older adults' form of life

As described earlier, forms of life are dictated by socio-cultural and psychological factors, but also by biological preconditions, out of which age and ageing are probably the most overarching. This is why ageing, in its different variations, provides us with a possibility to investigate typical examples of forms of life, those of older adults.

Form of life of older adults is a dynamic concept that can be reviewed only through different regularities that might constitute the situations of life that older people live in. These regularities influence the possibilities and threats, as well as strengths and weaknesses in forms of life. They are both stable and dynamic. In older adults' forms of life they become visible through both shared and individual attitudes towards activities in life and are determined by the physical and psychological capacity of the person as well as by socio-cultural factors.

Older adults have many different forms of life. For example, the forms of life of retired citizens, grandparents, widows, adult students, heart disease patients, diabetics, parishioners and culture-lovers all may be the ones that older adults engage in. However, these are very different from each other, and cannot be seen as a unifying factor for all older adults. As I will illustrate in the following, the forms of life of older adults are constituted of many different factors. Some of them are more or less unchangeable and transparent, and can thus be used to describe the stable regularities of the forms of life of older adults in general. They are something that we can grasp in the very beginning of the design, but also, if not properly understood, can carry the design to wrong paths irreversibly. Dynamic regularities, from their part, are rich in varieties and dependent on socio-cultural and psychological factors. They can also include a temporal perspective, i.e. change during the course of time. Hence, the first determinant of the forms of life of older adults is biological change, but the forms of life entail a number of socio-cultural and psychological changes as well.

The socio-cultural elements of older adults' forms of life, both given (such as the living environment, education, work history and number of relatives) and chosen (such as hobbies and friends), finally constitute the outcome of one's everyday activity and describe the materialisation of a particular form of life. In

this way, forms of life consist of individual and shared experiences of rule-following actions within a certain context. In the case of older adults, these contexts are related to the significant areas of older adults' everyday life. These areas include, e.g., activities of everyday life, social participation, travelling and cultural and entertainment activities (Leikas and Saariluoma, 2008b).

Older adults, as other citizens, may share several forms of life which can be viewed through culture. Especially the emergence of the post-working 'third age' with improved possibilities and opportunities for leisure has raised a question about different forms of lives of older adults. Along with better health conditions and economical situations and together with the raise of individualism, the forms of life have changed and are changing from the traditional ones. This is why the biggest mistake in the design for older adults would be to consider older people as representatives of one single form of life, and draw design decisions from that perspective.

5.3 Ageing and age

Forms of life of older adults are not a marginal issue among the variety of forms of life in general. Our world is ageing fast, and older adults are becoming a significant group of people numerically, economically and socially in many countries. The proportion of people aged 60 and over is growing faster than that of any other age group. Between 1970 and 2025, a growth in the number of older persons of some 223% is expected. In 2025, there will be a total of about 1.2 billion people over the age of 60. By 2050 there will be 2 billion people over 60, and 80% of them will be living in developing countries. (WHO, 2002). Population ageing is one of the greatest achievements of the humankind and also one of the greatest challenges. This phenomenon has been mostly associated with the more developed countries. Of the countries with more than ten million inhabitants that have the largest proportion of older people in the world, nine out of the ten are in Europe. Little change in this is expected by 2025 as people aged 60 and over will comprise an average of one-third of the population in countries like Japan, Germany and Italy, closely followed by other European countries. However, in terms of regions, over half of the world's older people live in Asia, and Asia's share of the world's oldest people will continue to increase the most. (WHO, 2002.)

According to the United Nations (United Nations, 2007), the percentage of 65-year-old people and over in Europe in 2050 will be close to 28%, in Northern

America around 21%, in Latin America around 18%, and in Asia around 17% (Figure 5). While the proportion of 60-year old people and over in Europe will, thus, be almost 30% in 2050, the proportion of 80 year-old people and over will be almost 10% of the population.

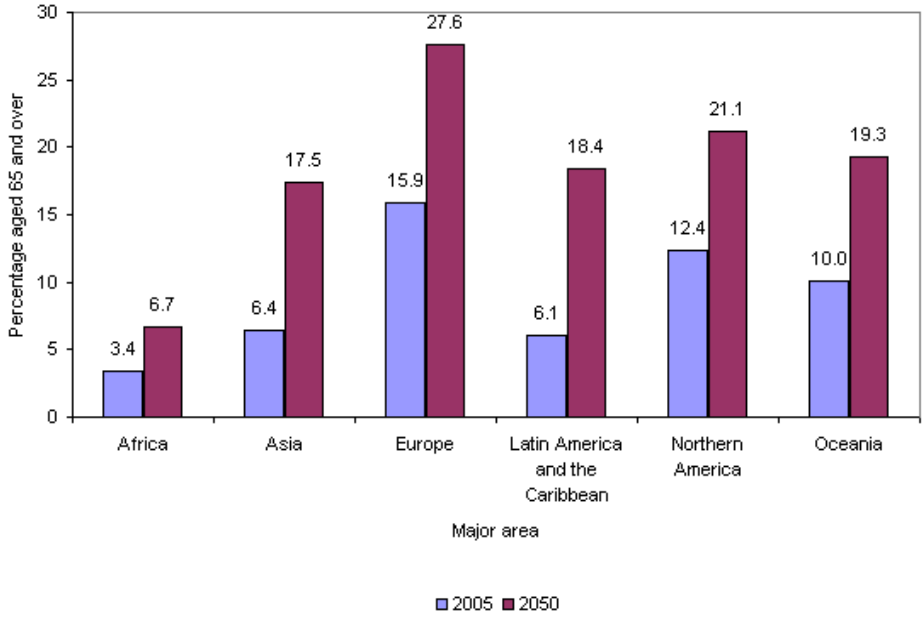


Figure 5. The proportion of 65-year old people and over in 2005 and 2050 (United Nations, 2007).

Life expectancy is globally increasing. In the Western countries the number of centenarians (persons older than 100 years) is expected to increase 15-fold between the years 1999 and 2050. Also, women are expected to live longer than men. (United Nations, 2007.) The oldest old, aged at least 80 years and over, is the fastest growing age group of older people (Table 5). According to Steg et al. (2006), the proportion of these very old people is predicted to almost triple in the European Union from 4.0% in 2004 to 11.4% in 2050. The highest proportions are expected to be found in Italy (14.1%), Germany (13.6%), and Spain (12.8%).

The life expectancy has risen from 55 years predicted in 1920 to over 80 years. As the large age cohorts ("the baby boomers") retire, the number of 65–80-year-olds will rise to almost 40% between the years 2010 and 2030. (Tilastokeskus, 2007; Tirrito, 2003.) This so-called population transformation will create significant challenges in Europe to social politics as well as to finances.

Information and communication technologies have a central role in responding to these challenges.

Table 5. Population forecast of 60-year-old people and over and 80-year-old people and over in Europe (United Nations, 2007) (medium variant 1950–2050).

60+			80+		
Year	(thousands)	(%)	Year	(thousands)	(%)
1950	66 472	12.1	1950	6 087	1.1
1955	71 686	12.4	1955	6 954	1.2
1960	79 374	13.1	1960	8 029	1.3
1965	89 891	14.2	1965	9 174	1.4
1970	101 624	15.5	1970	10 628	1.6
1975	111 300	16.5	1975	11 966	1.8
1980	111 290	16.1	1980	14 228	2.1
1985	119 080	16.9	1985	16 517	2.3
1990	131 124	18.2	1990	19 885	2.8
1995	138 097	19.0	1995	22 411	3.1
2000	147 966	20.3	2000	21 190	2.9
2005	150 923	20.6	2005	25 653	3.5
2010	160 060	21.9	2010	30 582	4.2
2015	171 633	23.6	2015	33 120	4.6
2020	184 658	25.6	2020	36 682	5.1
2025	197 573	27.6	2025	37 490	5.2
2030	207 749	29.4	2030	42 289	6.0
2035	215 644	30.9	2035	48 088	6.9
2040	221 318	32.2	2040	54 091	7.9
2045	226 336	33.5	2045	59 682	8.8
2050	229 414	34.5	2050	63 606	9.6

Today's older adults are healthier than before, but there are certain elements that still belong to normal ageing. These are the decline in physical and cognitive activity which, sooner or later, everyone will have to encounter. However, it would be inappropriate to define older adults by chronological age alone. Chronological age is not a precise marker for the changes that accompany age-

ing, as there are dramatic variations in health status, participation and levels of independence among older people of the same age (WHO, 2002). Ageing is no longer a fixed and homogenous process, and older adults are not at all a homogenous group. Many of them enjoy robust health and carry on an active lifestyle into their 80s and even 90s. Others may experience progressive deterioration of physical or cognitive abilities that require support from other persons already in their 60s. There are huge differences in health and activity, income, education and expectations within the ageing community. There are also national, ethnicity and gender differences.

Chronological, biological, psychological and social age all describe the different manifestations of age in our society. *Chronological age* means our calendar-age. It describes the ageing process rather misleadingly, for it doesn't take into account individual differences. Not even identical twins age at the same rate.

Biological age (Stuart-Hamilton, 2000) reflects the age-related changes in our functional capacity. Biological ageing manifests gradually as physical decline of the body. Psychological decline is, among other things, connected to changes occurring in memory and learning ability in the course of ageing. Biological age increases about one percentage per year from the age of 25–30 onwards. From the point of view of functional capacity, the increase in biological age can be considered to cause a "normal" decline of 1% per year. This would mean that a 60 year old is burdened 20% more than a 40 year old in the same physical job (Ilmarinen, 2006).

Psychological age is the age a person experiences him or herself ('feel old') to be at. It has bearing on how old (s)he looks like ('look old'), the age that (s)he acts out ('act old') and the age (s)he prefers to have ('prefer old') (Barnes-Farrell et al., 2002). The difference between psychological and chronological age usually increases by age.

By *social ageing* we understand all the changes that occur in the interaction between an individual and the society in the course of ageing. Social age (Stuart-Hamilton, 2000) describes the different roles an individual has during his or her lifetime, such as childhood, adolescence and adulthood. However, neither age nor life occurrences clearly distinguish young, middle-aged or old people from each other, any longer. Full-time employment, marriage and parenthood are disappearing as signs of adulthood in many societies. Due to prolonged education people enter the working life increasingly older, even at the age of 30 or more. Thus, social age can be considered to describe personal age, i.e. the extent

to which a person experiences to have achieved his or her personal goals. (Ilmarinen, 2006.)

During the elderly years ranging over a period of 30 years or even more, a person's situation can vary from independence and activity to total dependence and inability to take care of oneself. Old age can no longer be considered a phase of life that is characterized by certain features. Neither can different phases be characterized by the duration in years or by a certain age when they would begin. Therefore, the concepts of third and fourth age illustrate two different types of functional old age. *The third age* (Laslett, 1996; Stuart-Hamilton, 2000; Ilmarinen, 2006; Morrow-Howell et al., 2001; Jyrkämä, 2005) covers the time between working age and the actual old age. At this point the individual has already left the working life and lives an active life as a retired person. Based on chronological age this rather long phase is placed around the ages of 55/60–80/85. When the increase in the number of elderly people is discussed, it is largely a question related to this prolonged third age period group. Gerontological research suggests that we can only speak about elderly people and old age from the age of 85 years onward. Also the term 'senior citizen' is commonly used to refer to people in the third age. This refers to the active phase which follows directly the working years when the changes in physical and cognitive abilities due to old age begin to appear gradually and individually (Koskinen, 2004). This is the active phase after the working life, when the person has a good idea of what (s)he wants to do and the freedom and possibility to carry out his or her will.

The fourth age (Stuart-Hamilton, 2000) covers the phase when a person needs an increasing amount of help from others to manage in everyday activities. Generally speaking, it means the actual old age is considered to begin approximately at the age of 85, but people can be forced to proceed to it earlier if their health and functional capacity substantially deteriorate. During the fourth age the need for care and dependence on others increase due to illnesses and declined functional capacity. Also, at this point the need for social services, especially health care services, increases. (Karisto and Konttinen, 2004; Jyrkämä, 2005.)

The prospects of the third age have clearly improved during the last years: the healthy, active lifetime presumably lengthens at least as much as the entire lifespan. The difficulties of the third age can more and more often be conquered and a satisfactory quality of life can be maintained by setting the goals to match the resources. In the near future the older adults experiencing the third age will consist of the post-war generation. The expectations and needs of this generation are

different from the earlier generations due to improved living conditions and prolonged lifespan. For this generation, growing old might in many respects mean growth and personal development (Koskinen, 2004; Karisto, 2005). The prospects of the fourth age remain, however, uncertain and difficult to predict, but since the stages of life follow one another, we may assume that a successful third age improves the quality of life during the fourth age, also (Heikkinen and Ilmarinen, 2001).

In addition to objective health also self-experienced health is significant for an individual. Heikkinen (2002) describes the human functional capacity with a model based on activity theory and constructionist idea of man (Figure 6). In this model the actualization of actions is affected by functional capacity, but also by motives, goals, the significance of different activities, feedback about the actions taken (physical, psychological, social), own decisions and optimization, and finally, compensatory resources.

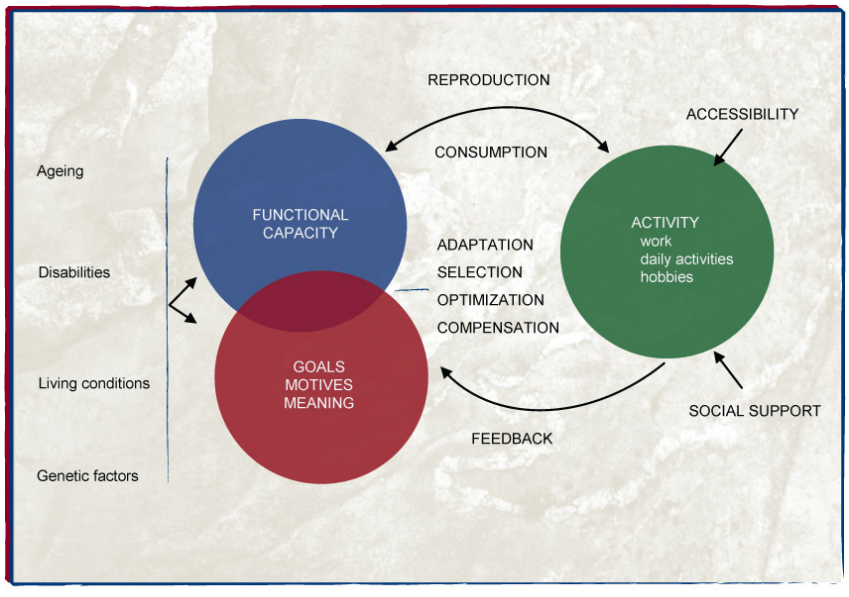


Figure 6. A model of the relations between ageing, functional capacity and activity, and the factors that influence them (Heikkinen, 2002, p. 27).

The central factors in the model are the ability to adapt physically and mentally to the situation of growing old, selection in defining goals, optimization and compensation of means for achieving the goals, as well as goals and meanings. The process of setting goals is affected, for example, by estimates of achieving

the goals, their relation to other goals of the individual and the compatibility of the goals with social demands, individual functional capacity and personal motives. Important margins are created by contextual factors, such as, e.g., different means for maintaining sufficient functional capacity and health and thus a satisfactory quality of life. (Heikkinen, 2002.)

5.4 Age-related decline in functional and physical capacity

Biological factors are the most predictable ones of senior citizens' form of life and can have almost equal influence on the physical condition of individuals inside this cohort, whereas cultural and social factors can include remarkable variation within the cohort and thus influence the formation of different forms of life between different groups of older adults. Biological factors represent the most stable and 'given' factor of form of life whereas social and cultural factors with arbitrary signs and meanings may evolve and change. In this sense, biological ageing creates differences in the forms of life between two cohorts, older and young people, and socio-cultural factors can be seen to create differences in the forms of life within the given cohorts. However, inside the cohort of older adults, biological factors may also change a lot. We can see more and more heterogeneity within, e.g., 70-years old people in terms of their physical condition. There are people who can still fully enjoy their time at a golf course or jogging track, whereas some others of the same age group have severe difficulties in managing their daily activities.

Before going further in the examination of biological ageing in relation to physiological functional capacity I will discuss another remarkable aspect in the biological ageing of modern older adults. This is ageing of the appearance. The impacts of the ageing of the body are quite salient in the appearance of people and are increasingly a concern of middle-aged and older people, and a large business opportunity for many companies, also. Today there seems to be a pressure to prevent or delay bio-ageing and continue the shaping of the body across the lifetime. Huge expenditure on anti-ageing nutrition and the rising popularity of cosmetic surgery, such as chemical skin peels, scleropathy (removing distended veins on the legs), hair transplantation, facelifts and tucks, forehead lifts and blepharoplastry (correction of drooping eyelids) all tell about the desire to rejuvenate one's appearance (Gilleard and Higgs, 2000). This is, to a great extent, due to a growing individualization of the ageing experience and is con-

nected with lifelong striving towards prolongevity where people themselves want to choose how and when to age. Gilleard and Higgs (2000) see the ageing body as a key element in the postmodern uncertainty over what constitutes the natural, and talk about "the increasing lifestyle aestheticization, exemplified by anti-ageing cosmetic surgery, as a cultural epiphenomenon of the commodification and marketing of health" (Gilleard and Higgs, 2000, p. 133).

Biological aging indeed brings changes to our appearance, but from the point of view of managing our daily life, the influence of biological change to our physical capacity is seen as more important. Physical ageing is a set of biological processes that are, to certain extent, genetically determined, and impose constraints on how later life can be lived and experienced.

Although there are differences within the same age groups, the biological factors in the forms of life of older adults are similar in their basic forms and not comparable with the ones experienced by younger people. For example, older people's physical capacity is related to the impairments that older people suffer from. These impairments are most often age related, due to biological change, and often connected to each other. Thus, it is typical for older people that they will in the course of time (although the timing is individual) suffer from combinations of these impairments whereas young people most often have one impairment or illness at a time. Thus the influence of this combination of impairments, the physical decline related to old age, is a major element in directing the formation of forms of life of older people. Socio-cultural factors determine, from their part, how older people can cope in their everyday life despite of the possible illnesses and disabilities.

Along with ageing, our functional capacity decreases (Tirrito, 2003; Morrow-Howell et al., 2001; Stuart-Hamilton, 2000). The decline takes place in the areas of vision, hearing, and motor and cognitive functions. Also, along with the extended life expectancy, the likelihood of severe illnesses, such as dementia, increases. According to WHO (2002), the major chronic conditions affecting older people are

- cardiovascular diseases (such as coronary heart disease)
- hypertension
- stroke
- diabetes
- cancer
- chronic obstructive pulmonary disease

- musculoskeletal conditions (such as arthritis and osteoporosis)
- mental health conditions (mostly dementia and depression)
- blindness and visual impairment.

In addition to biological factors, in many cases the causes of the diseases are external. There is a general agreement that lifelong trajectory of health and disease for an individual is the result of a combination of genetics, environment, lifestyle, nutrition, and chance (Kirkwood, 1996). Thus, the influence of genetics on the development of chronic conditions such as diabetes, heart disease, Alzheimer's disease and certain cancers varies to a great extent among individuals. For many people, lifestyle behaviours such as not smoking, personal coping skills and a network of close friends can effectively modify the influence of heredity on functional decline and the onset of disease (WHO, 2002).

Although there is a lot of variety in health conditions and functional capacity of younger older adults, there are, however, many similarities in the health status of the oldest old people (aged 85 and over). As this information is relevant from the point of view of interaction design, I will introduce here briefly some studies of the health status of the oldest old in different countries. Population-based studies with separate analyses for the oldest old in Scandinavia (Goebeler et al., 2003; Haavisto et al., 1984; Heikkinen et al., 1997; Ingerslev, 1992; Nybo et al., 2001a; Sörensen, 1982; von Heideken Wågert et al., 2006), in the rest of Europe (Baltes et al., 1993; Cacciatore et al., 1998; Deiana et al., 1999; Dening et al., 1998; Heeren et al., 1991; Hofman et al., 1991; Jagger et al., 1993; Launer et al., 1999; Meller et al., 1993), in the US (Breitner et al., 1999; Edland et al., 2002; Fichter et al., 1995; Kovar et al., 1992) and in Canada (Canadian Study of Health and Aging, 1994) illustrate that older aged people more often than younger aged people have poorer hearing and vision (Dening et al., 1998; Haavisto et al., 1985; Heikkinen et al., 1997; von Strauss Fratiglioni et al., 2000), declined cognition (Cacciatore et al., 1998, Fichter et al., 1995; Fratiglioni et al., 1992; Heikkinen et al., 1997; Haavisto et al., 1985, Jagger et al., 1989; Svensson et al., 1993) and higher rates of memory disorders and dementia (Edland et al., 2002; Haavisto et al., 1985; Heeren et al., 1991; Launer et al., 1999; Miech et al., 2002) as well as depression (Cacciatore et al., 1998; Dening et al., 1998; Fichter et al., 1995).

The activity of older people is significantly affected by health and the feeling of well-being (Cohen-Mansfield et al., 2003; Hirvensalo et al., 1998; Lehr 1992). Activity has in turn been discovered to be connected to subjective well-

being and partly maintaining it (Everard, 1999; Menec, 2003). Physical activity and leisure-time activities have been noticed to have a positive impact on psychological well-being (Arent, 2000; Biddle and Faulkner, 2002; Cummings, 2002; Everard, 1999; Lomranz et al., 1988; Morgan et al., 1991). In addition, the social factors connected to activity are often more significant than the physical ones to older people (Everard, 1999; Väätänen and Leikas, 2009). For men physical and out-of-home activities are more central, while women's activities are more social and home-related (Dallosso et al., 1988).

Older people often face difficulties in managing the activities of daily living (ADL) (Cacciatore et al., 1998; Dening et al., 1998; Heikkinen et al., 1997; Parker et al., 1994). According to studies, women manage poorer in this area than men (Cacciatore et al., 1998; Heikkinen et al., 1997; Nybo et al., 2001b; Parker et al., 1994; Samuelsson et al., 1997, von Strauss et al., 2000). Women also are more often widowed and live alone, whereas men are more often married (Baltes et al., 1993; Haavisto et al., 1984; von Strauss et al., 2000). In addition, women have poorer physical capacity (Heikkinen et al., 1997; Parker et al., 1994; Samuelsson et al., 1997) and cognition (Cacciatore et al., 1998; Canadian Study of Health and Aging, 1994; Fichter et al., 1995; Haavisto et al., 1984; Parker et al., 1994; von Strauss et al., 2000) and a higher prevalence of dementia (Canadian Study of Health and Aging, 1994; Fichter et al., 1995; Haavisto et al., 1984; Heeren et al., 1991; Johansson and Zarit, 1995; Launer et al., 1999; Miech et al., 2002) but a lower prevalence of malignancies (Samuelsson et al., 1997; von Strauss et al., 2000) than men.

Malnutrition is a serious health problem amongst the oldest old (von Heideken Wågert, 2006) in many countries. In older people, malnutrition can be caused by limited access to food, socioeconomic hardships, a lack of information and knowledge about nutrition, poor food choices (e.g. eating high fat foods), disease and the use of medications, tooth loss, social isolation, cognitive or physical disabilities that inhibit one's ability to buy foods and prepare them, emergency situations and lack of physical activity (WHO, 2002).

Increased alcohol consumption and older adults is a new factor that can be seen arisen from the postmodern elements of the society. Three varieties have been distinguished: early onset, intermittent, or reactive alcohol abuse (Tirrito, 2003). Early onset is associated with older persons who begin abusing alcohol in late life. Intermittent abusers are occasional abusers, and reactive abusers are those who began the use of alcohol following a life crisis. Also pain, insomnia, anxiety, and depression may increase the use of substances.

Alcohol consumption by older adults has increased in many countries, and especially women drink today more than the earlier generations. In many cases the death of the spouse is a trigger to increased consumption. Also, becoming retired can as such have an influence on drinking habits. In general, the post-war generations have absorbed much more liberal drinking habits, and these first liberal female drinkers are about to become older adults now. Alcohol abuse is not a problem only from the point of view of an individual but is about to become a major problem also from the point of view of social and health care organizations.

The functional capacity of ageing people has been an object of broad and diverse research theoretically and empirically as well. However, that research has been criticized (Jyrkämä, 2006, 2007) for dividing the functional capacity into physiological, psychological and social segments and in this way narrowing down the research of functional capacity. Most research concerns physical capacity and the changes in it throughout years. Least amount of research has been conducted on social functional capacity. Research results are mostly quantitative and the indicators measure large target groups instead of individual people. The functional capacity is seen and measured largely as a feature of an individual, it is more seldom that the research is directed to how and in which kinds of situations the qualities in question are used. The object of the research is thus potential functional capacity, not the actual functional capacity in use. People are seen as 'carriers' of functional capacity rather than as active operators and users of it.

Besides quantitative measurement, the human functional capacity ought to be seen as a balance between cognitive capacity, and will and emotions, which draw their resources from the life lived. Therefore gerontologists call for a more holistic approach in research through, for example, the way how functional capacity is socially defined. Functional capacity should be seen as everyday activity and functioning and it should be studied as experienced, interpreted, awaited and expected capacity. The emphasis should be moved from individuals' qualities to activity, as well as situations and practices of action. It is essential to differentiate between being able to do something and being competent at doing something, knowing how to do something, wanting to do something, being obliged to do something, and finally feeling that something has to be done. When functional capacity is understood as performative functional capacity, it requires and enables the presence and participation of older people in different fields, according to gerontological and gerontechnological research. (Heikkinen, 2002; Jyrkämä, 2006.)

5.5 Cognitive capacity, personality and coping in life

5.5.1 Age-related cognitive decline

The forms of life of older adults are influenced also by the psychological capacity of individuals. Psychological capacity determines, for example, the possibilities and willingness to participate in different socio-cultural groups and thus to carry out activities in different areas of life. Cognitive abilities, such as self esteem, memory and sense of coherence as well as personality as such all influence the formation of forms of life by determining the framework of activities that the person is willing and able to realize in her or his life.

During normal ageing, some cognitive capabilities decline with age. These are, e.g., learning speed, memory, and perception (Tirrito, 2003; Stuart-Hamilton, 2000; Atchley, 2000). Older people tend to be slower to learn new skills and have a difficulty in memorising and reacting quickly to instructions (Huppert et al., 2000). Reduced intellectual ability with age has also been reported (Schaie, 1996). However, this decline may only be apparent in complex situations and also be counteracted by high levels of education, in which case the decline proceeds slower (Schaie, 1989).

Although some healthy aging people maintain high cognitive functional capacity throughout the life, most people are faced with age-related cognitive decline (ARCD), which manifests as a group of different physiological changes (Cohen, 1993). The impact that ageing has for example on memory functions varies substantially between individuals. It is often hard to differentiate the impacts of ageing and other life-related factors such as health, educational background and lifestyle and their relation to the decline of cognitive functioning. The decline of cognitive functions has a negative impact on a person's lifestyle, experienced independence, creation and maintenance of social relationships and other activities requiring cognitive ability (Mahncke et al., 2006). Many older adults are also concerned about ARCD-symptoms and their possible relation to Alzheimer's disease or other dementing illnesses.

It was assumed earlier that the age-related changes in information processing, like cognitive functions, would be non-recoverable. Now we know that thought skills and learning capacity can be maintained and improved even during later years due to the flexibility of our central nervous system. According to different research results concerning the possible effects of training on cognitive functions and transference, training has positive effects, but its effects do not necessarily

extend to activities outside the trained functions. (Willis and Schaie, 1994; Ruoppila, 2002.)

Learning is an important part of our everyday life. Learning occurs either as a recognized or subconscious experience. On a physiological level, the possibility of sustaining and improving cognitive skills and learning abilities even in old age is based on the flexibility of the central nervous system (Ruoppila, 2002). Our knowledge about the prerequisites and possibilities of psychological activation is mainly based on new studies of how the psychological capacity of older people, especially information processing, alters with age, which factors affect these changes and how this information processing can be maintained or improved. The follow-up studies on cognitive functions (Suutama and Ruoppila, 1999) indicate that a significant characteristic of these functions is a remarkable stability, although individual differences do exist. Information processing functions have been noticed to decline and especially slow down in performances that require speed and intellectual flexibility.

The losses in cognitive capacity can be compensated by wisdom, knowledge and experience, all of them abilities that older people have gained during the course of time. Often, declines in cognitive functioning are triggered by disuse (lack of practise), illness (such as depression), behavioural factors (such as the use of alcohol and medications), psychological factors (such as lack of motivation, low expectations and lack of confidence), and social factors (such as loneliness and isolation), rather than ageing per se (WHO, 2002).

With respect to memory, age-related changes have also been found (Stuart-Hamilton, 2000). Older adults may experience a decline in short-term memory, especially with more demanding tasks which require active manipulation of the information or division of attention (Cohen, 1996; Tirriro, 2003) or when the short-term memory is severely taxed (Howard and Howard, 1996). There is also evidence for long-term memory problems: episodic memory impairments are common whereas semantic memory problems only occur in extreme old age (Howard and Howard, 1996). Non-declarative memory (also known as implicit memory) appears to be relatively unaffected by age (Gaudreau and Peretz, 1999). Prospective memory is known to deteriorate in relation to age (McDaniel and Einstein, 1993; Huppert et al., 2000). Along with dementia, memory disorders express themselves especially as problems with short term memory, confusion and disorientation (Stuart-Hamilton, 2000).

Psychological research includes studies of memory with meaningful material. In the case of older adults, it seems that retrieval becomes slower with age, but if

cued, information is readily retrieved. Distraction during the storing process can interfere with the information processed and can affect retrieval of information (Tirrito, 2003). In the cases where there has been evidence of decline in specific skills, well-practiced, familiar, and adaptive skills have been retained into old age (France, 1990).

The loss of memory functions is perhaps the most overwhelming issue that people fear about in getting old. When people age, they often quite anxiously assess their own memory ability and react to changes in it. Our beliefs about our own memory are based on the experiences of success and failure in our everyday life. Besides our performance, there are also other factors that influence our beliefs of our own memory. These include negative stereotypes of ageing. These beliefs and expectations may reflect to the activities we are willing to carry out, might cause underestimation and even determine what goals we set for ourselves. Although older people often feel that their memory performance has declined remarkably, different studies show that the relations between subjective evaluations of memory and objective memory performance are often weak (Cook and Marsiske, 2006; Schmidt et al., 2001). Subjective feelings of memory impairment can also be influenced by frames of reference (optimistic in comparisons with other people, pessimistic in comparisons with one's own previous level of functioning) and associated more with personality traits than with actual memory performance in normal elderly people (Hänninen et al., 1994).

Prospective memory is memory for a future act, or a future sequence of actions (Cohen, 1993). It includes remembering what the planned action is, remembering to perform it and when and where to do it. In order to cope successfully with the demands of everyday life, prospective memory is perhaps the most important aspect of our memory. We have to remember our appointments, to take our medication, and to carry out different tasks such as pay bills and make phone calls. Often we tend to use different aids, such as calendars, egg timers, alarm clocks and post-it tags to help us remember these tasks. In order to remember what actions to do in the future we must also remember the actions that we have already performed. Thus, prospective memory can not be isolated from *retrospective memory*. You have to remember the actions that you have already performed, e.g., that you have taken your medication, in order to avoid performing it twice. Although prospective memory declines with increasing age, most elderly people are able to offset this decline by spontaneously adopting different ways of using external cues (linking a prospective task to another routine event) to remind themselves of prospective tasks (Cohen, 1993).

Prospective memory encompasses *spatial memory*. Remembering to do tasks requires remembering where to do them. Spatial memory is the ability to remember the location of different objects and landmarks and to navigate successfully inside buildings and outdoors. We all know elderly people who can't remember where they have placed their keys or spectacles, or who have difficulties in orienteering in shopping centres or in remembering where the car had been parked. Anderson and Hellstrup (1993) connect spatial memory to visual imagery and suggest that the processes underlying visual imagery play a major role in everyday perception and support the on-line processing of spatial information, and that visual imagery can be used to simulate future plans and actions.

5.5.2 Self-efficacy, self-esteem and meaning in life

Our behaviour is strongly influenced by our confidence in our ability to successfully perform it. The theoretical term to analyse this confidence, self-efficacy, was coined by Bandura in 1977. Perceived behavioural control is a related term in the theory of planned behaviour which refers to an individual's perception of the ease or difficulty of performing the behaviour of interest (Ajzen and Driver, 1991). Perceived self-efficacy (concerned with judgements of personal capability) and self-esteem (concerned with judgements of self worth) do not represent the same phenomena and there is no fixed relationship between these concepts (Bandura, 1997). Anyhow, both are acquired in different forms of life along the life course and influence the way people age and the way they manage their everyday life. These coping styles determine, for example, how well people adapt to the transitions and possible crises of ageing.

Self-efficacy is the belief people have in their capacity to exert control over their lives. It is linked to personal behaviour choices as one gets older. Self-efficacy refers to an individuals' ability to achieve a desired outcome, and it influences in choosing as well as maintaining activities (Bandura, 1977). Beliefs of self-efficacy influence our choices of activities, preparations for activities, efforts undertaken during performances, as well as thought patterns and emotional reactions (Bandura, 1977). For example, self-efficacy has a central role in predicting health related behaviour and behavioural change (Walker, 2001). Self-efficacy has been found to be behaviour specific and vary across different domains of activities, within the same activity domain at different levels of difficulty, and under different circumstances (Ajzen and Driver; 1991; Bandura, 1977, 1997; Walker, 2001). Self-efficacy is particularly important when the task

requires specific knowledge and skills, because it is necessary for people to have and believe to have knowledge how to achieve a desired outcome (Walker, 2001). Successes in challenging tasks improve whereas repeated failures lower self-efficacy. Also, seeing another individual perform a similar task and being reinforced for it, may have a positive effect on self-efficacy if the similarity between the model and the observer in terms of personal characteristics that are relevant to performance is high.

The concept of competence is used for studying the self-image of an older person. Older adults constantly have to evaluate their competence, in other words, the sufficiency of the physical, psychological and social resources for managing everyday activities and different transitions in life. (Ruoppila, 2002.)

When assessing their capacities, older people tend to compare themselves with others of the same age. People who for some reason feel themselves old or older than their peers might have lower self-esteem, whereas people who feel themselves younger than their peers possibly have higher self-esteem (Hunter et al., 1981–1982). Physical activity has been found to improve self-esteem, but the mechanisms behind this remain unclear. Social support and good social networks, a good financial situation and the presence of a spouse reinforce self-esteem. Bad health and deterioration of physical functioning naturally lower self-esteem. Depression and anxiety are often connected to low self-esteem. Thus the impact that age has on self-esteem might be due to deteriorating health and decline in functional capacity. (Fukukawa et al., 2000; Lee and Shenan, 1989; Ryff, 1989; Schieman and Campbell, 2001.)

It is essential from the point of view of psychological well-being to experience life as meaningful. Searching for the meaning of life often consist of will to find and arrange a balance for one's own existence, pursuing and achieving useful goals and the feeling of fulfilment in life. The experience of meaning of life increases throughout years and is at it's strongest among over 75-year-olds. (Reker and Wong, 1988.)

5.5.3 Personality

Our personality is a rather stable structure which is determined in the first five years of life and does not change over the years (France, 1990). It can be seen as "the individual characteristics and ways of behaving that, in their organization or patterning, account for an individual's unique adjustments, to his or her total environment" (Hilgard et al., cited from Stuart-Hamilton, 2000, p. 139). Person-

ality characteristics are reportedly stable from young adulthood to old age among healthy, community-dwelling older adults (France, 1990). Personality reflects the personal history and the ultimate values, beliefs and other relevant characteristics of individuality of a person. Through the action based on these characteristics it is also connected to forms of life of a person. Therefore, through examining the personality of a person it is possible to gain insight into her or his forms of life.

There is no particular personality type unique to later life; personality characteristics influence the ability to cope with life's situations and behaviours that are health-seeking or health-damaging. Thus, some types of personality enable people to cope with later life better than others. Stuart-Hamilton (2000) introduces five main personality types for old people. This classification is based on the studies by Reichard et al. (1962) on aged men. In this category *constructiveness* is a trait where people have come to terms with their lives, and are relatively free from worries, while striving to interact with others. The *dependent* or 'rocking chair' type feels some contentment, but individuals are dissatisfied with products of their own efforts, and rely on others to help or serve them, regarding later life as a time of leisure. The *defensiveness* or 'armoured approach' type is essentially neurotic. People possessing that trait carry on working or are engaged in a high level of activity as if to prove that they are healthy and do not need other people's help. The fourth type: *hostility*, involves blaming others for personal misfortune. These people unrealistically attribute failures throughout their lives to factors other than themselves. The final type identified by Reichard et al. (1962) is *self-hatred*. The self-hating individuals are akin to the hostile type possessors, except that they turn their hatred and resentment inwards. Reichard et al. found that people of the first three types were well adjusted towards later life, whilst those of one of the latter two were less successful. (Stuart-Hamilton, 2000, p. 145.)

Reichard et al. (1962) argue that people's personalities develop long before the onset of later life. In other words, the types are not the result per se. Neugarten et al. (1961, 1968) studied a sample of people in their seventies. According to their studies, where four principal personality types (with subdivisions) were identified, the most desirable type was found to be the *integrated* personality. People in this category are either: *reorganisers* (as one activity becomes physically impossible, another is found); *focused* (activities are limited to a small set of feasible and highly rewarding ones); or *disengaged* (deliberate abnegation of many responsibilities). Another major type is the *armoured-defensive* personality. People in this

category are either *holding on* types who feel that they can stave off decay by maintaining a high level of activity; or they are *constricted*, and dwell on what they have lost as a result of ageing. The armoured-defensive individuals are less satisfied than those with integrated personalities. A third group possess *passive-dependent* personalities. Like Reichard et al.'s dependent/'rocking chair' types, such people rely on others to help them (*succourant seeking*), or they withdraw from interaction with others as much as possible (*apathetic*). The fourth and final group comprises the disorganised personalities. According to Neugarten et al. these people have serious problems and cannot be classified as functioning conventionally. (Stuart-Hamilton, 2000, p. 147.)

5.5.4 Coping in life

'Sense of coherence' is a term which can be used to examine people's coping in life. It describes the way how a person reacts in general when coming across different stress factors in life. According to Antonovsky (1984, 1993) people need different resources in their everyday life. When these resources are sufficient enough in respect to our needs, and when we know how to employ them, we are able to gain harmony in our life, in other terms, a sense of coherence. Sense of coherence includes resources which are not specific according to certain situations, but can be used in different relations. They are the internal resources of a person, and are based on the experience of manageability, meaningfulness, structure and comprehensibility. The sense of coherence expresses the inner capability of seeing different possibilities around oneself and grasping those that are the best possible ones in relation to requirements.

The resources of older adults, as well as other citizens, have remarkable increased during the last decades. Physiological needs have been satisfied quite sufficiently for the majority of the population, and people age much healthier than the earlier generations. Instead, the upper levels of Maslow's hierarchy of needs (1954), such as love for one's neighbour and need for community, respect, and self-fulfilment have become central in respect to wellbeing.

Older people have developed behavioural patterns and significations that help them along throughout different phases of life. Thus they have reached the forms of life where many things can already be taken for granted and because of that live in harmony with the world outside. When a person is happy with his environment that he controls, the will to learn new things isn't necessarily that strong any more. On the other hand, many older people still see the world as challeng-

ing and continuously seek for new experiences. For some, it is indeed the days of retirement when they really feel in control of their own life. Many people experience retirement as the time of freedom and hobbies. A person's way of life affects the will and possibility to learn new things.

At the age of 65–74 people start to worry about issues related to their retirement and their independence. Also, concern over global issues, such as pollution, nuclear war and war in general, the usage of nuclear power and concern over natural catastrophes increases with the old age. People's lack of concern towards each other increases the feeling of insecurity. Uncertainty in everyday life is related to loneliness, uncertainty in work life, haste, problems in human relationships, and the information overflow. Other notable issues that people worry about in older age are, for example, concern over loosing one's memory, dependency on other people and the fear of finally being sent to an institutionalised care. (Niemelä, 2007; Leikas, 2007.)

5.6 Values and individualism

Ageing influences our conception of life, shaping our roles and values. When we get older, we learn to inspect ourselves in relation to the environment and give different meanings to different things. The significance of these meanings should be understood in technology development. This understanding can be accomplished with the help of value research which is empirical research on people's moral and practical values. Concrete data on values can be found from, e.g., the theories of Rokeach (1979) and Schwartz (1992, 2001).

Common needs that unite older people in general are issues related to independence, time, environment, and social life, and these are manifested in social relationships and taking care of others, keeping up routines and ways of action, continuity, participation, belonging and territories (Jacobson, 2006). Along with ageing, such values as hedonism and supporting one's own gratification usually give way to more traditional values like responsibility and taking care of others (Ilmarinen, 2006; Lindqvist, 2002; Puohiniemi, 2002). Thus, rapid changes in the surrounding environment, as for example organisational changes or ever escalating development of technology, may haunt older people who lean on basic values like respecting traditions and emphasizing safety. On the other hand, those older adults who also value open and courageous attitude towards new things may find changes in the environment interesting and fascinating (Puohiniemi, 2002.)

Puohimiemi (2002) has studied the values of Finnish citizens of different age groups. The Finnish set of values is changing little by little along with the regeneration of the population structure which changes from economy and performance centred industrial society towards postmaterial values based on subjective wellbeing. The set of values of young people who have grown up in a prosperious welfare state is very different from the one of their grandparents who grew in the industrializing Finnish society and to whom satisfying basic material needs was the central challenge (Puohiniemi, 2002; Hämäläinen, 2006).

This change in values and the rise of *individualism* has been noticed not only in Finland but in all modern societies. Individualism means the growth of individual meanings compared to collectives and authorities, and at the same time greater independence in relation to all social and traditional bonds. An individual has an opportunity to choose valuations and constantly assume new roles, free from traditions and authorities (Mäkinen, 2006). Individualism is increasing in modern societies, and even such values that emphasize extreme individualism ("everything to me at once") have rapidly gained ground.

This phenomenon, 'postmodernism', has important implications in terms of people's tastes and values. Postmodernists contend that universally held truths and value systems are disappearing from society and, as a result of this, classifications and value judgements are becoming less meaningful. This obscurity and incongruity in values can be seen also in the influences of technology. It has been claimed that the problems in technology faced by the modern society would primarily relate to unclarity and discrepancy of values (Lindqvist, 2002).

An implication of the disappearing value systems is that people's values may become increasingly difficult to predict, and making assumptions about people's lifestyles and values on the basis of their demographic characteristics is becoming increasingly difficult (Jordan, 2000). This is also the case with older people who are already a very diverse and heterogeneous group with different experiences of life, different lifestyles and socioeconomic and educational backgrounds. Along with sufficiently well satisfied basic needs, the situations in life and sets of values of older people are becoming differentiated, and individualism has become a significant value alongside communities (Gilleard and Higgs, 2000; Karisto, 2005; Mokka and Neuvonen, 2006). People have individualistic values that emphasize individual goals. Thus, along with the new active generation of senior citizens, the difference between generations is not as clear as it used to be, as the spectrum of values increases.

How do individualism and wealth then generate forms of life? Older adults have started to live for themselves more than previous generations. Today's older people are wealthier and more educated that the earlier generation and they have fewer inheritors. So, the primary concern is not any more the economical wealth of children and grandchildren. In parallel with this, people have started to invest on their own wellbeing in terms of travelling, spending time in wellbeing centres and spas, and eating out and participating in different cultural and club activities (Mokka and Neuvonen, 2006). Older adults want to decide about their activities on the basis of their individual choices and preferences. Money is a catalyst for these activities, making certain forms of life possible.

5.7 Social networks

The forms of life of older adults are shaped by an increased need for social relationships. Along with retirement, people have more time and desire for social activities and communication with others. On the other hand, at the same time the relationships established in worklife in many cases vanish.

Social relationships of older adults easily become twofold. For many people, the family remains a resource and shelter even though family relations change in form and function. In addition to family, older people have an increasing number of contacts with different officials and organisations, such as home health care and home care. The initiator of these relations is usually some third party (Marin, 2002.). These relations are in many cases vital to an older person, but do not usually satisfy the need for friendship and companionship. About 20% of older people are childless (Hooyman and Kiyak, 1996). Due to marriages at older age there is a group of older persons who will not have the support of children and grandchildren but who may enjoy the support of friends, neighbours and other communities.

The loosening of family ties since the 1950s has been remarkable in all Western countries. This trend has been the strongest in the USA and north-western Europe, but family ties are loosening across most of Europe (Gilleard and Higgs, 2005). A key factor in this is the nature of kinship and contacts between kin, which now instead of relying upon physical proximity depends upon looser systems of 'keeping in touch'. In the past grandparents, children and grandchildren lived together. Today, due to sufficient financial independence, most of the older people prefer living in independent households. This has changed both the nature of community as well as kinship.

Community and neighbourhood have offered a network of social relationships and provided support and meaning to older people. However, as a result of higher income of people, increased mobility, and looser family ties, local communities have a much salient structure in the lives of older people than they used to have. Gillerad and Higgs (2005) suggest that the communities of propinquity that have remained are incapable of fostering the cultural fields of the third age, because of which finding sufficient social space and networks outside the family is a central challenge for many retiring persons. They argue that families rather than communities have shown more flexibility in adjusting to the present conditions of social life. Because of separation from communal relationships of physical proximity families have sought new forms for exchange and to stay in touch, without the influence of co-residency or close neighbourhood. It has been argued (Gilleard and Higgs, 2005; Vollenwyder et al., 2002) that within these changing relationships it is possible to observe greater equality in the exchange of support, more opportunities for parents to maintain a balanced system of exchange with their adult children and, at the same time, sustain independent lifestyle.

Different leisure activities, enjoyed due to better health and earlier retirement, serve as means for creating and keeping up social relationships, companionship and informal social support networks. In addition, they may replace one's work role, increase pre-retirement interests, maintain a positive self-esteem, and enhance mental health (Atchley, 2000; Ruoppila, 2002). Social activities outside home enhance mental wellbeing, whereas older people, especially male who have few leisure activities, become more easily depressed and lonely compared to those with many activities (Everard, 1999; Lomranz, 1988; Pahkala, 1990). An illness that restricts activity influences negatively on wellbeing. A Finnish eight-year follow-up study examined the influences of physical activity, such as leisure activities and physical functional capacity, on depression and mental wellbeing (Lampinen, 2004). According to the study, physical activity seems to decrease depression and is related to good self-esteem. In this sudy, physical activity was connected to and predicted mental wellbeing in terms of better physical functional capacity and higher activeness. In addition to physical activity, such factors as age, gender, managing daily activities, chronical illnesses, self experienced health, education, and cognitive capacity all had a more or less significant role in the relation of physical activity, mental wellbeing and leisure activities.

According to a MOBILATE study in five countries in 2000 concerning outdoor activities of people at the age of 55 and over (Mollenkopf et al., 2004), the

most popular hobbies were watching the television, listening to the radio, meeting friends and relatives at home and outside home, reading, travelling in the home country, handwork, walking, talking on the phone, picking berries and mushrooms, and keeping fit. People over 75 years old had less and somewhat different hobbies than those at the age of 55–74. The differences between men and women were found in the quality of hobbies. Men were fond of actively exercising sports, following sports events, fishing and hunting, and keeping fit. Women visited religious events and talked on the phone more than men.

Many older people feel themselves lonely. Loneliness is a substantial factor when considering older people's social capacity. According to studies, an average of 30% of older people feel themselves lonely and are in danger of becoming isolated due to decreased number of social relationships (Holmén et al., 1992; Prince, et al., 1997; Samuelsson et al., 1998; Tijhuis et al., 1999). Changes in social practices such as less visiting among neighbours, more home based entertainment and the changing socio-demographic patterns such as a larger number of older people living alone, as discussed above, have led some older people to experience a diminution in contacts and in communication. Even older people who have children and who are visited regularly by them sometimes lack companionship and opportunities for involvement with peers.

Loneliness is not a similar concept to social isolation, which appears often simultaneously with loneliness. Our social networks can usually be objectively measured, but loneliness is always a subjective feeling. For example, living alone does not necessarily mean that a person is lonely, whereas someone can feel herself lonely though living surrounded by many people. It is clear that loneliness can provoke depression in a way that a person without contacts to other people can become depressed and turn inwards (Stuart-Hamilton, 2000). Loneliness can be negative but depending on people and context it can also be a positive experience of solitude.

When entering the fourth age and especially the phase of oldest old, the feeling of loneliness tends to become common. This is influenced by the losses in meaningful relationships and the decline in functional capacity of an individual, which is often a result of restrictions of chronical illnesses and lack of meaningful participation. Health problems prevent some people from getting out, and this may also lead to boredom and loneliness. The studies show that living alone and being socially isolated tend to increase the likelihood of experiencing loneliness. On the other hand, having an intensive social network decreases the feeling of loneliness (Jylhä, 2004).

Studies concerning the relation between old age and feeling of loneliness are somewhat contradictory. In general, cross-studies show that people feel lonely more in the old than in the young age (Holmén et al., 1992; Prince, 1997). On the other hand, it has been showed that age as such has no clear relation to the increase of loneliness, but that the incidence of loneliness is relatively stable (Creecy et al., 1985; Samuelsson, 1998). The number of people experiencing loneliness seems to increase in the way that it is more common among people over 75 years old, but occurrence of loneliness evens out after the age of 90 (Andersson, 1998). On the other hand, men of a very high age have been found to have more experiences of loneliness than when younger, which may be related to moving to institutionalised care, becoming a widow or to the experience of poor health (Tijhuis et al., 1999). Age may also relate indirectly to the increasing experience of loneliness through weakening health and functional capacity (Holmén et al., 1992; Mullins and Elston, 1996). Also decline in cognitive capacity, low income, rare social relationships and networks as well as infertility, depression and anxiety all are related to the experience of loneliness. (Lampinen, 2004.)

Depression of older people is unfortunately often a consequence of isolation, and has become already a big problem in Europe. It can sometimes lead even to suicidal thoughts and thus be the main reason for the decision for institutionalised care. There are different ways to prevent depression, and physical exercise, in addition to social relationships, is one of them. Studies show that physical activity strengthens the essential components of a mentally healthy human being, such as self-confidence, self-appreciation and self-assertion (Korhonen, 1999).

5.8 Mobility

It is commonly believed that adult residential mobility and moving around declines with age. This tells, however, little about the desires of people, those who decide to stay and those who move. We usually think that older people are neighbourhood bound, and indeed, the strengths of social bonds and attachment to own home still play a significant role in the lives of many older adults. In the present cohorts of retired people there are, however, many who desire to travel and to experience new places. As people are free from work and many social responsibilities after retirement, freedom to move becomes a serious challenge to many. There are also many who consider and enjoy the possibility to move to another place with a different lifestyle during the retirement days. This is mostly

due to health and income improvements since earlier generations. These people consider retirement as the longest holiday ever.

The moving activity of retired people is often seasonal. People buy or rent a "second home", a house or an apartment, usually in a warmer climate. The number of "snowbirds", people who live in the North and buy or rent a property in the South, has risen in the USA, Canada, Australia and Europe (Gilleard and Higgs, 2005). Even if the majority of older people do not leave home for good, a steadily increasing number are engaged in seasonal migration both in Europe and in America. Gilleard and Higgs, (2005) argue that retirement has begun to extend across an increasing number of countries and continents, adding a new retirement dimension to the globalization of cultures and commerce.

One sign of seasonal migration is the increasing number of holiday houses. In Finland, for example, where "summer cottages" have always been a fundamental element of the Finnish culture, people have started to renovate them so that they would be 'winter proof' and allow living by the lake during the wintertime also.

Gilleard and Higgs (2005) deliberate that this desire for seasonal migration might represent improving mobility with age, a new freedom from the ties that bind older people to their neighbourhood, and new possibilities of not being tied down by age. With a "second home" far away from the permanent one, these people have become less attached to a place. Gilleard and Higgs believe that as a result of the availability of deferred income to purchase amenities for a warm and well-provided-for lifestyle more exciting and empowering later-life communities may emerge to offer a new take on 'ageing in place'.

'Ageing in place' is a concept which aims at supporting older people to remain in their homes for as long as they can care for themselves (Lee, 2009; Mynatt et al., 2004). This, of course, is cost-effective from the point of view of the society, but also in many cases seen important in respect to people's quality of life. The environment can play an important role in enabling a good life (Wahl and Weisman, 2003). For many older adults ageing in place means living in a pleasant neighbourhood with kith and kin nearby, with good local services and reasonable access to a range of leisure facilities. Some counter-arguments against ageing in place have, however, been also introduced. The concept has been questioned of not taking into account wider communal identities of people, which no longer find expression in the social spaces of the locality. Gilleard and Higgs (2005, p. 124), for example talk about "the latter-day vagabonds" whose identity is anchored in mobile lifestyle instead of locality and, and ask "what choices can there exist for older adults to exercise agency and express their own

sense of belonging by choosing to resist 'ageing in place'". And what about those who cannot choose, those, who can do no other than grow old in place? It is the poorest people in the society who are the most likely to age in place, as they are the least likely to move from the place where they have spent most of their life. These people will benefit the most of the dependency upon their neighbourhood.

5.9 Baby boomers

The 'baby boomers' are a cohort of individuals who were born after the Second World War. Baby boom is a worldwide phenomenon and was experienced, after the Second World War, in countries that participated in the war as well as in those that did not. In a narrow sense, baby boomers are people who were born during the years 1945–1949, and in a broader sense during the years 1945–1954.

This generation will reach the age of 65 in the period from 2010–2030, so baby boomers are about to become older adults. This cohort of 75 million persons (Tirrito, 2003) will remarkably change aging as it is currently experienced because of their different life experiences and expectations. Many hopes of these people can be met today in a quality that was not possible even 50 years ago, and technology has had a major role in this progress, changing the forms of life of people. New technology and improved health status will impact the social and economic life of these people. The significance of this group as people who wish to benefit from the different technologies they have is also going to be strong from the point of view of technology development. This is why I find it necessary to study the forms of life of these people in more detail in this chapter.

The baby boomers are now gradually retiring, which possibly leads to a shortage in the work force, increase in pension costs and increased use of health care services. This cohort will retire as early as possible and pursue varied leisure activities. The baby boomers will retire in a healthier state than the older cohorts. As the first teenager generation they have also formed a self-image of 'forever young'. They have often over forty years of work experience as many of them began their work life already at the age of 17 (Gilleard and Higgs, 2000; Karisto, 2005.) They often look forward for the third age, the age between work and old age, to devote it for their own personal well-being (Laslett, 1996).

The heterogeneity of the baby boomers is due to the differences in work and education as well as differences in income. The values in life differ much from the earlier generations as well as inside the cohorts. These generations offer

various challenges to technology. Coping in work life is one of the most important challenges. Secondly, as most of these people have already reasonably good ICT skills, they will be a generation of technology users in their old age. They will challenge markets and demand value for their money, being more eager to try new products and services than the earlier generations. The material-cultural capital is much more important than before, and for example, luxury machines and special interests products can be highly meaningful (Gilleard and Higgs, 2000). As the baby boomers age there will be a generation of technology users, which will change domestic and international markets, create new business models, influence politicians as well as create new challenges for social and health care service (European Commission, 1999; Karisto, 2005; Tirrito, 2003, US Department of Commerce, 2005).

The turn of the 50's and 60's was a time of a great change in many respects, also in technology development. For example, in Finland the chainsaw emerged to help in forest work and the first refrigerators, washing machines and vacuum cleaners found their way to homes. The next steps were TVs and cars. Moreover, the emergence of ready-to-wear clothes and fashion in general united young people, who wanted to jump out of the older generations by dressing in tight jeans and leather jackets. The baby boomers is regarded as a generation that has a positive attitude towards novelties and new things. This generation has always built its self-image on the ability to face challenges and create newness (Karisto, 2005.)

5.10 Successful ageing and good life

People can influence their ageing more than has been assumed. Among other things, lifestyle and way of life affect our health and work capacity as we age. Characteristics of physical environment, work conditions, economic situation, services offered by the society, social relationships, friends, social values and social capital are all associated with successful ageing (Heikkinen, 2002; Ilmarinen, 2006.). The nature of ageing was studied in the 1950's and 60's from the perspective of life satisfaction. Good ageing was then indicated by positive values in the dimension of life satisfaction, which was characterized by the will to live, persistence, braveness, will to take responsibility of one's own life, feeling of approaching one's goals, self respect, optimism, and a hopeful stance towards the future.

'Active ageing' is a theoretical perspective, which investigates the active way of living associated to ageing, i.e. keeping up physical and mental capacity, so-

cial relations and participation (Heikkinen, 2002; WHO, 2002). The concept of active ageing was launched at the Second World Assembly on Ageing in Madrid in 2002, and is getting more and more relevant as the number of persons over the age of 60 increases. It is estimated that in the world this population has reached the number of around 600 million people, and this number keeps increasing. In Europe, it is expected that, by 2020, more than 25% of the citizens will be aged more than 60 (WHO, 2002).

The 'active ageing' theory has got more support than the so-called Disengagement theory (Tirrito, 2003) and its latter modification the Gerotranscendence theory (Tornstam, 1994). Gerotranscendence means the paradigm change in the flow of life course, through which an ageing person reconstructs a totally new perspective to life. Following this view, a human being slowly separates from his or her social rights and responsibilities giving thus space to younger people. Retirement, for example, can be seen as a mutual withdrawal between the individual and society, and as beneficial for both the individual and society. The theory has been criticized of not taking into account that older people may not want to disengage from society.

The idea of active ageing, on the other hand, has been supported by many, and not least because of its social emphasis. In contrast to the Gerotranscendence theory, the emphasis in this approach is in the activity and participation of older persons. It is understood that the longer a person can stay active, the less she or he is expected to demand services from the society. On the other hand, stressing activity includes negative sides also if considered from an ethical point of view. We should understand that dependency from other people is a human right, and older persons should be able to place their trust on it when their own capacities are not sufficient any more. (Heikkinen, 2002.)

According to the World Health Organization (WHO, 2002), ageing should be a positive experience, and longer life must be accompanied by continuing opportunities for health, participation and security. WHO has adopted the term 'active ageing' to express the process for achieving this vision.

WHO aims at improving the health and quality of life of people of the third age (55–80). To this end, it is carrying out the Healthy Ageing program, within which the concept of Active Ageing is defined as follows (Figure 7):

"Active Ageing is the process of optimizing opportunities for health, participation and security in order to embrace quality of life as people age. WHO/Europe is highlighting the issues associated with active ageing, i.e. fostering policy advocacy, promoting healthy lifestyles, reducing health risks and

increasing quality of life, because ageing will put increased economic and social demands on all countries of WHO European region. At the same time, older people provide a precious, often ignored resource that makes an important contribution to the socioeconomic fabric of our lives." (WHO, 2002.)

According to WHO (2002), when active ageing is supported both in an individual and population level, there will potentially be

- fewer premature deaths in the highly productive stages of life
- fewer disabilities associated with chronic diseases in older age
- more people enjoying a positive quality of life as they grow older
- more people participating actively as they age in the social, cultural, economic and political aspects of society , in paid and unpaid roles and in domestic, family and community life
- lower costs related to medical treatment and care services.

Active living improves mental health and often promotes social contacts. Being active can help older people remain as independent as possible as long as possible. It can also reduce the risk of falls. There are thus important economic benefits about older adults being active (WHO, 1998).

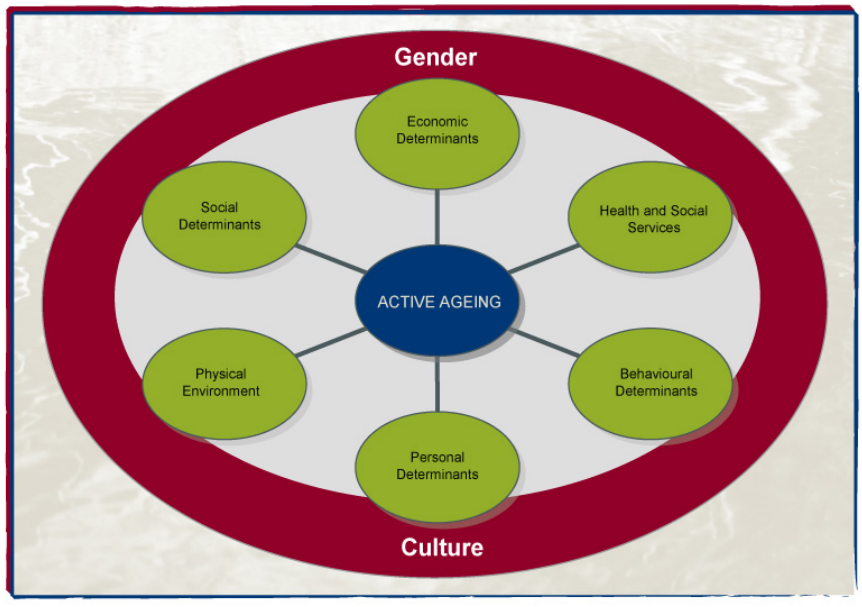


Figure 7. The determinants of active ageing (WHO, 2002, p. 19).

What is good life and good ageing? What are the central values of good old age and who can define them? Aristotle says that good life is a goal which is pursued by everyone. In practical life, it is not a goal which can materialize irrespective of our everyday activities. Good life is made up of good activities. Therefore, the individual actions which are made to realize it are part of the goal itself (Aristotle, n.d., trans. 1984, 1097a30–1097b6).

'Achieving good life' became important already in the 1980's. The choices and actions of an individual and the conditions of the environment were supposed to be balanced. Good ageing was thought to be composed of four dimensions: mental well-being, experienced quality of life, competent behaviour and objective environment. An ageing human being felt well mentally, if s(he) was not depressed, did not feel agony in life or did not look pessimistically to the future. The experienced quality of life was related to subjective experiences of ageing people concerning family, friends, hobbies, work, economic situation and living conditions. Competent behaviour meant that an ageing person had good functional capacity, good health, sufficient knowledge and skills to act independently as an adult citizen, and capability to interact with others. There was supposed to be a harmony between the individual's choices and activity and the resources offered by the environment. (Koskinen, 2006.)

The phenomenon of 'successful ageing' has been under constant investigation and theoretical development (Rowe and Kahn, 1998; Morrow-Howell et al., 2001). Today, successful ageing is defined by three main dimensions. Successful ageing presupposes that an ageing person has good health and physical functional capacity. This means that a person has been able to avoid the decline in these areas and is able to constantly develop his or her physical activity. Secondly, it is emphasized that an ageing person should constantly take care of the cognitive abilities such as the faculty of problem solving, conceptual processing and linguistic abilities. Thirdly, it is assumed that an ageing person takes actively part in social activities such as social networks, meaningful activity, hobbies and communities. The model of successful ageing emphasizes that all of these criteria must be satisfied in order to achieve the goal of successful ageing. (Koskinen, 2006.)

In this model, successful ageing is seen as the main responsibility of the individual, and structural barriers to the achievement of a good quality of life are not addressed. Social expectations can open or close opportunities for older adults in employment, education and leisure. There is also a danger of confining successful ageing only to people in good health, although dignity, respect, autonomy

and social engagement should also be seen as essential ingredients of the 'good life', irrespective of the health and mental condition of older people.

The notion of 'robust ageing' entails all the above discussed notions of ageing. Robust ageing became in the 80's and 90's a sort of an umbrella notion for different notions related to strengths, capabilities and positive sides of ageing. The researchers (such as Garfein and Herzog, 1995) described the main dimensions of robust ageing with such concepts as functional status (physical capacity), affective status (state of mind and mood), cognitive status and productive participation.

The notion of 'courageous ageing' is forward-looking. Courageously ageing persons are those who have focus, visions and who like to take risks. A person ageing courageously is a constantly developing individual and ready to meet challenges in all periods of life. (Koskinen, 2006.) Tirrito (2003) points out that the search for successful ageing is in the ability to be a courageous ager and describes the courageous ager as experiencing four pinnacle stages. These are transience, early old age, middle old age, and old-old age. Tirrito (2003) sums up the requirements for people in these stages to achieve their goals for ageing successfully. In the early stage, *the complacency phase*, or middle age (45–54), the individual should be deepening attachments and connections to the social world and developing a feeling of satisfaction. In *the transience phase* (55–64), the major task is to begin to feel free from many of the social restraints of the early years and to search for new heights of experience. The task is to achieve inspiration or suffer the consequences of apathy. In *early old age* (65–74), the task is to develop wisdom, or the ability to transcend conventional thinking and develop one's own world view. Failure is associated with decline (wisdom development versus degeneration). In this stage, the mind takes precedence over factors related to physical functioning, and it is the spirit of the individual that helps prevail over difficulties. In middle old age (74–85), *the engagement phase*, there is the challenge to remain engaged in life in spite of the many changes in social roles and health status. Engagement versus detachment presents the challenge in finding new ways of self-expression. In old-old age (85 and older), the courageous agers are those who live in the present because they have been able to make peace with the future. They remain in charge of their own lives and are in control even of their own dying. (Tirrito, 2003, p. 238.)

According to a Finnish study, ageing people themselves consider, first of all, good health as a precondition of successful ageing (Jyrkämä, 1995). This is followed by reasonable livelihood, positive stance towards life, workable human relations, family, activeness, good housing and religion. Older people wish thus

to retain as long as possible their capacity to take care of themselves and their own affairs, take part in their own networks and remain active (Hammar et al., 1999; Leikas and Lehtonen, 2007.)

'Productive ageing' is an approach which aims to break different stereotypes of ageing and old age. It underlines the importance of ageing people as active and productive citizens of the society (Morrow-Howell et al., 2001), in contrast to 'ageism'. 'Ageism' is age-based discrimination, associated with the changes that ageing brings to the functional capacities of people (Atchley, 2000; Giddens, 2001; Gilleard and Higgs, 2000; Laslett, 1996; Stuart-Hamilton, 2000; Tirrito, 2003). In this view, ageing is seen as the main and only characteristic which goes beyond all other aspects, such as values and inquisitiveness.

Along with the discrimination by the outside world there is a danger that older adults themselves begin to internalize the negative attitudes of ageing and old age and undermine their confidence in their dealings with the physical and social world, leading them to entertain lower expectations of themselves as agents (Gilleard and Higgs, 2000). This kind of internalized ageism erodes the self-confidence of older people, reducing expectations, leading to poorer health, fitness and mental performance, and increased risk of disability. On the other hand, ageism can also have a reverse effect on older adults, in terms of excessive shaping of the body by submitting it to cosmetic surgeries and using immense amounts of anti-ageing medicine and cosmetics. Also, ageism is responsible for society's negative attitudes toward sexuality in old age (Tirrito, 2003). As sexual attractiveness is equated with youth and physical appearance, these societal attitudes toward sexual expression in old age can have negative effects on the physical and mental well-being of older adults.

WHO (2002) challenges older people themselves to take a positive attitude towards ageing. Political and social recognition of the contributions that older people make and the inclusion of older adults in leadership roles will support this new image and help de-bunk negative stereotypes. Educating young people about ageing and paying careful attention to upholding the rights of older people will help to reduce and eliminate discrimination and abuse.

Culture surrounds all the other determinants of active ageing and thus shapes the way in which people age. Individual values determine how a person regards his or her individual ageing, whereas cultural values and traditions determine, to a large extent, how a society views older people and ageing in general. For example, culture factors have an influence on how such behaviours as smoking or using alcohol are regarded from the point of view of health, or how the society

looks at ageing in general. These attitudes can also change in the course of time, as can be seen from, for example, the increased use of alcohol by middle-aged and older women in Europe. There are also huge cultural diversities among countries and within countries in terms of values, attitudes and traditions.

5.11 What does it mean to construct a form of life?

In the preceding sections of this chapter I have introduced a substantial amount of information which scientific research has collected concerning the biological, psychological and socio-cultural aspects of older human beings. When considering technology and design for life, this knowledge of human beings has two deficits. Firstly, it is not properly organized and we cannot thus use it as such. Secondly, we have to be able to select the relevant information in respect to technology design. In this process of organizing the data and selecting relevant information, the notion of form of life is very practical as it allows integration of many types of knowledge in a purposeful manner.

So, in the beginning of analysing and constructing a form of life of older adults we have this substantial amount of scientific information concerning older human beings. This information is extensive but it is not all-embracing in respect to forms of life. In addition to it, it is necessary to carry out empirical work to complete our knowledge of a particular form of life.

The first step in constructing a form of life for the design is to describe a particular form of life. After that we have to explicate and describe the rule-following actions within this form of life. Especially important are those actions which we think that could be improved with the help of new technology.

Secondly, we have to find the relevant facts which could make us understand the nature of the rule-following actions of people. These facts introduce many important preconditions for the design of the actual technology. They can also be used to explain why this form of life includes certain characteristics in the first place.

The third and an important step is to analyse all value aspects associated with a form of life and the possible new technology. Values are attributes of a form of life which enable us to understand many choices among the technologies and actions. They may also make it understandable for us why a form of life has a certain system of rule-following actions.

5.12 Summary

The definition of a form of life in the context of design for life is a constructive process including three different steps. To begin with, one describes a form of life, then determines the important and design relevant rule-following actions in it, and finally selects and attaches the relevant attributes, i.e., the facts and the relevant value aspects, to the whole.

Older people's life is characterized by different types of forms of life, such as being a grandparent, a retired person and a parishioner, carrying out daily errands, following cultural events, paying visits to friends and relatives, taking care of personal wellbeing and health, travelling, and spending time at a holiday house. These in turn are characterized by different types of rule-following actions. In addition, forms of life are modified by different attributes, i.e., facts and values in people's life. In this chapter I have presented these attributes of the forms of life of older people on a general level.

Facts are divided into biological, psychological and sociological ones. Biological facts are essential in defining and understanding the basic elements of a form of life. In the case of older adults these facts are, e.g., age and decline in physical capability, increasing life expectancy, increasing occurrences of chronic illnesses and combinations of different illnesses. We know that among younger older adults there is a lot of heterogeneity in biological factors but there are many similarities in the health status of the oldest old. The oldest old have usually, e.g., poorer hearing and vision than younger aged people.

Psychological and socio-cultural facts are those that arise from the psychological and socio-cultural elements in people's life and become visible by modifying accordingly the rule-following actions in forms of life. When considering older adults, these facts are both given and chosen. During normal ageing, some cognitive capabilities decline with age. The oldest old have declined cognition, higher rates of memory disorders and dementia as well as depression than younger aged people. Information processing functions decline and slow down in performances that require speed and intellectual flexibility. Older adults' coping in life is partly determined by personality, as well as self-efficacy and self-esteem which are acquired in different forms of life along the course of life. The insecurity in everyday life is related to loneliness, uncertainty in work life, haste, problems in human relationships, and the information overflow. In older age, people also worry about loosing one's memory, being dependent of other people, becoming lonely and being sent to an institutionalised care.

Values have a social, philosophical, aesthetic and practical dimension. They explicate individual or group goals, musts, obligations, conceptions of beauty and goodness in life. They arise from the activity of people and determine the preferences of activities. Common needs that unite older people are issues related to independence, time, environment, and social life, responsibility and taking care of others. However, individualism is increasing in modern societies and affects people's values, which means that values are increasingly difficult to predict on the basis of demographic characteristics. In general, older adults are wealthier and more educated than the earlier generations and want to invest on their personal wellbeing. For them, good health, reasonable livelihood, workable human relationships, family, activeness, and good housing are preconditions of successful ageing. The forms of life of active older adults are shaped by individualism, loosening family ties, an increased need for social relationships, mobility in terms of having a holiday house and travelling, and different leisure activities. The values of the "forever young" baby boomers differ much from those of earlier generations.

In the following I will discuss how the construction of a particular form of life can be implemented and effectively utilised in the design of human-technology interaction and design for life.

6. Life-Based Design

6.1 Technology is for life

Technology should enhance people's ability to carry out actions in different areas of life. There is always a specific reason for adopting and using technology, and this is to reach the goals that people have set for themselves in their everyday life. Technology's role is to serve as a tool to help people achieve these goals in general, and to be able to accomplish them easily, safely, reliably, or comfortably. Even technology that is developed merely for entertainment purposes should fulfil these criteria.

The measure of technology is life, i.e., how much technology is able to enhance the quality of people's lives. Unfortunately ICT technology is perhaps the number one field of technology that has been decreasing the feeling of self-efficacy among older people. It is the experience of many older adults that the technology in our everyday lives is both complex and difficult to deal with. Disappointments with new devices easily create the feeling of low self-efficacy and might even affect a person's self-esteem. For example, financial transactions that we make in our everyday life increasingly involve the use of payment cards, keypads and screens. We interact with screens and key pads on cash machines. We are asked to check payment amounts on visual displays and enter PIN numbers through keypads. These types of transactions take place, for example, in shops, restaurants and petrol stations every day. Smart cards and Chip and PIN cards are nearly always required for these financial systems. Older adults with low vision, poor manual dexterity, and cognitive impairments such as weak memory can find these devices very difficult and even humiliating unless the terminals and user-interfaces are easy to reach, easy to see and easy to operate. (Gill, 2004.)

The rapid development of technology and our much slower rate of biological evolution do not go hand in hand. Our body, the skeletal system and muscles, are adapted to function in very different environments than the environment built with the new ICT technology. In fact, although traditional human-factors approaches are often concerned with psychical aspects of product use, quite paradoxically the usage of ICT technology has shrunk our activity to cover only a small area of our body functions. Only the motor functions in our upper body play a significant role in the usage of different technologies. There isn't too much, for example, for the feet to do in this area. Different usage patterns of ICT systems and devices are based on holding out, grasping, pressing and pushing, and require good eye-hand coordination and fluent mobility of upper limbs, hands and fingers. In addition, they require good vision and in many cases, good hearing, also.

In fact, the whole activity of using ICT technology is concentrated around the triangle which consists of the hand, the eye and the ear. Typical examples of the devices are keyboards, mouse pointers, mobile phones, remote controls, card readers, digital displays of many household machines and touch screens of different automated machines. Actually, the list is endless. Thus, in order to cope with all kinds of technologies in our everyday life we need to have the relevant good capacity at least in our hands, fingers and eyes. However, unfortunately these are the very body parts that will be affected by the age and eventually during ageing will face decline in their capacity. This decline is inevitable and will confront every person. If nothing changes, this will pose difficulties for each and everyone of us in accessing and using present technologies.

There are countless mistakes that designers have made in their efforts to design for older adults. One example of this is the use of an electronic cash card, which challenges all the functional capacities of an individual. When using it, one is supposed to know how to put the card into the machine, to remember the PIN-code of the card, to write down the code using the small buttons of the card reader and to read the text on the small screen to select the functionalities and follow the orders, and all this while in most cases a queue of people, waiting for their turn, is forming behind. Even if one could remember the PIN-code under these pressures, the system is useless, of course, in case the eyeglasses were left at home.

Another example is the mobile phone with all its extensions, as mentioned already earlier. The size of the device is too small, the surface too slippery, and the buttons too small and inappropriately designed for use, not to mention the screen

which is too small in general as well as the size of the fonts. In addition, for many older people the phone consists of too many functionalities which only hinder the usage of the most important ones.

Modern technology is difficult for older adults for two reasons. Firstly, the design is not consistent with the experience that older people have gained of technology in their forms of life. The looks of the devices can be strange and the operations logics unfamiliar. User interfaces are incomprehensible, as they do not seem to bear any relation to the life that older adults have lived nor the experiences that they have gained with tools and equipment in their former days. Secondly, the changes in people's physical and cognitive condition arise from many problems in coping with ICT technology. The lower levels of the impairments do not normally lead to difficulties in using ICT technology but can easily cause problems in adverse circumstances such as in dark and noisy environments. On the other hand, these hearing, vision and mobility impairments may arise in parallel and combine to make ICT products and services more difficult to use for older people. Physical problems can make holding, e.g., a handset difficult and make keypad or touch screen operation slow and inaccurate. Being in a wheelchair or needing a walking stick can make access to machines and devices difficult. These tasks may also prove painful.

6.2 From life to technology

It is not possible to understand what people need from technology if we do not start the design from life. Examining and analysing life is always the starting point for technology design. For the designer it is not even possible to consider technology development without considering life because the user and life are always constructed inside technology. There is no technology that would exist outside life. The important question is whether we analyse life only through our everyday knowledge, intuitively and without separating different elements of life, or whether we carry this analysis out scientifically with the help of a systematic methodology.

It is not possible to understand technology in life if we do not fully comprehend the life itself. Life is a multifaceted and an endlessly varying phenomenon with countless of dimensions from which it can be examined. This is why life as such cannot be a core concept for technology design. We have to find a concept which could help us to differentiate and accurately define these dimensions. In order to gain understanding on where to go and which aspects to stress in the

product design from the user's point of view, it is crucial to understand how the users perceive their everyday life, and what kinds of restrictions and incentives their have in their daily rule-following actions.

Thus, enhancing the quality of people's lives, with the help of technology, calls for responsible design thinking. Forms of life offer a simple but very usable approach to examine life in all kinds of situations. They define what people do by defining their rule-following actions and attributes in a context. With the construction of a description of form of life it is possible to get an idea about what ICT-designers can do to advance the lives of the people sharing that form of life.

Defining components of form of life is a focal step in design. Good understanding of a form of life allows designers to understand how people could be supported in their pursuit towards the goals they have in participating in a particular form of life.

6.3 Life-Based Design process

The aim of Life-Based Design is to bring vital understanding of people's life for the basis of the creation of design ideas and concept design and also to guide the whole development process of products and services. It is thus the kind of activity which should be carried out first in the development process. It will produce decisive information for further phases in the development process, such as concept development.

It makes sense to separate Life-Based Design within the conceptual design process. Life-Based Design is conceptual design by nature. Its goal is not a fully defined technical solution to some problem, but a conceptual description of a technology for further technological design. As was mentioned, one cannot design a technology without making assumptions about life, users and clients. Life-Based Design would allow designers to have a rational model and system of human requirements on which the design could be based. Thus, the outputs of the Life-Based Design process are product and service concepts.

So far I have introduced form of life from the point of view of analyzing and understanding life. Now it is essential to examine how this concept can be used in a Life-Based Design process. For this reason, this chapter discusses the basic concepts of Life-Based Design and shows how form of life and its associated concepts, the rule-following actions and the attributes of a form of life can be used in a Life-Based Design process.

When we reflect on the course of a Life-Based Design process, it is essential to keep apart the design actions and the evolving design plan. The design actions are operations that a designer or a design team carries out to complete the design plan. Thus, in the middle of a design process the plan is still incomplete, and designers have tasks that they have to carry out to complete the design plan. A description of the design process, and especially the Life-Based Design process, means defining tasks and operations that must be carried out in order to proceed from the concept of life to the actual product or service concept.

Basically, the first step in the Life-Based Design process is to define the problem that the designers want to solve. Of course, they have to evaluate whether the final output is worth executing. They have to have an idea what is the worth of the output, i.e., does it improve and contribute to human life, is it ethically valuable, is it realizable, is it cost-effective, does it have a rational business logic and does it have a rational social logic.

Secondly, the designers must be able to link the design plan with the practical form of life. They have to have a description of how the new design idea can improve the human actions that are intended to be improved. The design ideas must explicate the meaning of the new technology in a future practice. When Nokia, for example, designed its new mobile phone with no antenna, it improved the way we could carry the mobile phone in the pocket and in this way improved the mobile form of life. This is apparently a small but a very elegant interaction innovation. It is good to remember that really important technologies are often based on small innovations.

The third step is the actual design process, in which the design plan is divided into sub-problems and these problems are solved on the ground of the knowledge we have about human beings and their actions. Of course, the type of knowledge we need depends crucially on the type of the target user group and the kinds of actions this group is expected to carry out with the new technology.

The logic of solving the sub-problems is important. In most cases they have to be solved separately, and there are often many alternative solutions for a specific sub-problem. This means that we have to reflectively make choices between different alternatives. Another aspect is that once we finally have been able to solve a sub-problem, we can incorporate it to the master design plan (cf. Saariluoma et al., 2006). In this way, the final plan is gradually constructed in the design process.

To explicate the process of Life-Based Design, it is essential to investigate how knowledge of life, i.e., forms-of life and their rule-following actions and

attributes, are used in carrying out the basic product development process. In the following, I will explain how knowledge of human life and its dimensions are applied in each stage of the development process and thus give an illustration of a conceptual process for human-technology interaction design.

To summarise, the process of Life-Based Design is an iterative process, which includes the following phases: 1) defining the design problems through the analysis of a form of life, 2) generation of possible design solutions, 3) analysis of design alternatives and 4) construction of design requirements from accepted design alternatives.

I will flesh out each stage of the Life-Based Design process and show how we can use our knowledge of human life in them. The best way to illustrate the use of the new concepts and their functioning in the logic of design is to apply them to an example of a design case. Therefore I shall also represent a case, in order to demonstrate what Life-Based Design means in practice.

At the end of this chapter I will show how Life-Based Design connects to the traditional human-centred design process.

6.3.1 Defining design problems: analysis of a form of life

The design always begins with a design idea. In Life-Based Design, ideas are derived from the lives of people. Because of this, life must be conceptualized in terms of forms of life. This means that the design ideas should be found by investigating the forms of people's lives.

Based on the facts of a particular form of life it is necessary to define first the *rule-following actions* that the new product or service is needed for. The developer should understand what kind of features would constitute the actions in the light of *facts and values* so that it would be possible to comprehensively comprehend the goals of people. Thus, a starting point is in perceiving human needs. This is a different approach to user needs, and should not be separated from the inspection of people's everyday life in general. In general, human activity starts from becoming aware of one's needs and making plans for satisfying these needs. In this sense, it is important to study and understand people's needs. The needs of people are connected with emotions and together with them define the personal value that people set for things and artefacts in their life. In this sense, feelings, emotions and motives open up a new angle of view into design. So first, in the light of form of life descriptions, we must ask what the new technol-

ogy is needed for. After this we have to examine how this technology can support the actions of people and the way people wish to achieve their goals.

After the analysis of rule-following actions and facts and values concerning the form of life we have *design-relevant attributes* for the design problem at hand.

6.3.2 Generation of design ideas: technology-supported actions

As I have argued above, forms of life are systems of integrated actions, or, to be more specific, rule-following actions. I have also pointed out that rule-following actions can be supported by technologies. We go often to a summer house by car, and, therefore, car is the technology which can be used to support moving to ones' summer house. Technology thus supports an action characteristic of a cottager's form of life. Generally speaking, technology is there to support rule-following actions.

Here it is necessary to make one final distinction. Not all rule-following actions are supported by technology. Some of them simply do not need any technology. If a dog owner strokes her dog, there is hardly any need for technology support, but if she wishes to restrict the dog's barking inside a flat, a special dog collar, which as a response to the unwanted barking produces an unpleasant spray of lemon, may be used. The former rule-following action is not supported by technology but the latter is.

This difference between the two kinds of rule-following actions can be made explicit by using the term *technology-supported actions* for the latter. Technology supported actions, in short TSAs, are actions which are realized with the help of technology. These actions are important in deriving design ideas from the forms of life. They are defined with the help of design-relevant attributes, i.e., the meaningful rule-following actions and form of life attributes in this particular context. Once we have investigated a form of life, found the rule-following actions and attributes (facts and values), and derived design-relevant attributes from them, we can begin to think how we could support some of these actions with a technology. It is these target actions that are called technology-supported actions (Figure 8).

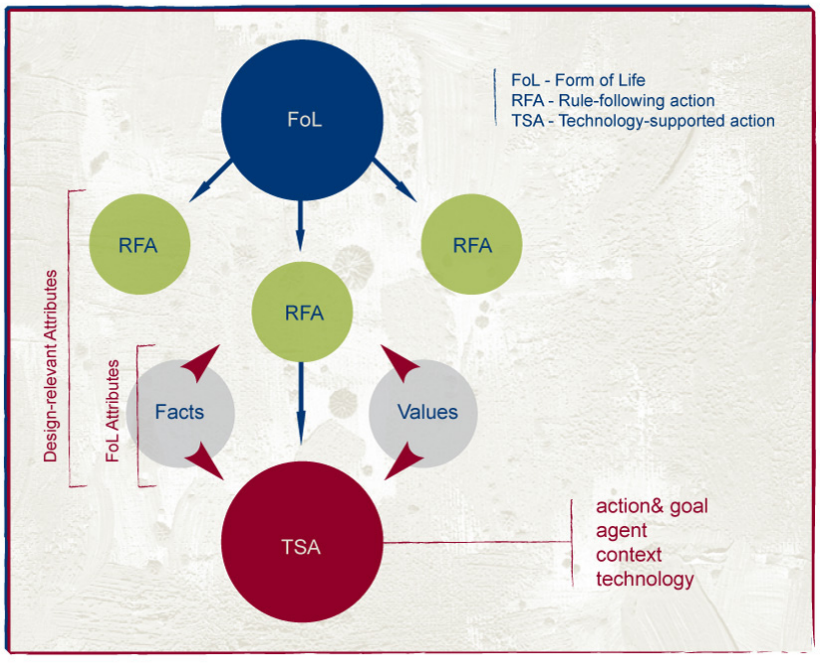


Figure 8. Generation of design ideas from a form of life.

Technology-supported actions should consist of elements relevant to the generation of design ideas. These elements are 1) the action and its goal, 2) the agent, 3) the context and 4) possible technology. This categorization is characteristic to all human actions.

These pieces of knowledge describe the problem and issues that need investigation in order to create a description of a technically supported action. For example, if we are interested in a service or a portal which could provide information for senior citizens' needs, we have to describe the senior citizens' needs for such a service. This means that we have to describe the actions that the users are supposed to carry out with the application. In addition, we need descriptions of older adults as users of technology (agents), and of the context of use. Finally, we need a description of the technology by which the service could possibly be realized, e.g., by mobile and fixed Internet.

The knowledge that we need in order to make the TSA descriptions can be obtained by analysing the attributes of the form of life. For example, the factual knowledge or the facts which were presented earlier in Chapter 4 concerning older people as users of technology would be helpful in describing the agents in

TSAs. Also, value attributes have a central role in this discourse. They are necessary in analysing the goals of the agents and in deciding what would the best way to reach these goals be, from the user's point of view. As already said, TSAs together with meaningful rule-following actions for this context constitute the design-relevant attributes.

Below, there is an example of the usage of this information. In this example case, there is a notice board placed on a door of a refrigerator with the intention to ease the life of older adults suffering from memory disorders. These people need communication technology, e.g., an advanced calendar, for reminding them about important errands, meetings, cultural services, medication, and other events. In addition to reminding people, the service should also provide them with the possibility to maintain social networks and to make new contacts. Therefore, an electronic notice board with wireless functionalities could be a solution for organising the everyday life of these older adults.

Form of life

- A form of life of lonely older people who have memory disorders.

Rule-following actions

- Remembering daily errands and meetings with people.
- Maintaining and creating contacts with friends and relatives.

In order to fully benefit from the usage of technology supported actions, the TSAs have to be described in a way that supports the generation of design ideas. I have already given a structure for describing the TSAs, which includes the action and its goal, the agent, possible technology, and the context. Following this, an example of a TSA for a memory support system for older adults would consist of the following:

Technology-supported action and goal

- Remember appointments in order to organise one's everyday activities.
- Provide memory support for everyday errands in the form of reminding, alarming, and checking.
- Create and keep up contacts and social interaction with other people.
- Provide effortless communication modes.

Agent

- *Design-relevant facts*
    - an older person
    - problems with memory
    - weak ICT skills
    - low vision & hearing
    - weakened eye-hand coordination.
- *Design-relevant values*
    - need for social interaction
    - need for coping in everyday life
    - need for preventing isolation.

Context

- physical: inside and outside; noisy environment, sunshine, notice when sleeping
- social: family, friends, service organisations.

Technology

- mobile portable technology with easy-to-use user interfaces
- visual signal, flashing light or other alarm
- voice recognition.

As can be seen from the example, deriving technology supported actions from rule-following actions and design-relevant attributes, and creating descriptions for TSAs enable us to use convergent design thought processes (Saariluoma et al., 2006). This means that we can define accurate problems and concentrate on designing solutions for these precisely defined problems. This decreases the unwanted desire to reformulate the problems in order to find an easier solution for them. Convergent creativity is in many ways suitable for Life-Based Design. The contents of the problems are derived from the content of the technology-supported actions. This keeps the contents of a form of life actively inside the actual design thinking. Creativity is not about random associations and loose intuitions but based on accurate analysis of what people do in their lives when they participate in some form of life, or in other words, in its rule-following actions.

6.3.3 Analysis of design alternatives

According to Saariluoma et al. (2006) design thinking entails a reflective mode. This means that the main problem is divided into a set of sub-problems. For example, if we work to design a web page, we have to think separately such problems as colours, language, icons and uses of space. Thus the design of a web-page demands reformulation and solving of those sub-problems. In order to solve the sub-problems we need to have special knowledge which fosters us in solving these problems.

In the previous section the structure of a technology-supported action was outlined. I suggested that for this structure we need information about the action and the goal, the agent, the context, and the technology. The description of the TSAs takes the design process forward as it raises sub-problems in the design. For example, if the task is to use an e-commerce service, we can use the explicated TSAs and attribute information to generate sub-problems. These sub-problems would be, for example, how to get people to trust the service, how users should pay their purchases and how people could easily and intuitively use their credit-cards in paying. Such sub-problems emerge automatically, when the TSAs are analyzed.

The sub-problems and solutions can be either conflicting or complementary. *Conflicting sub-problems* cannot be used in the final solution because they would functionally require different things in similar situations. For example, the designer of a web page cannot place the input fields for credit card payment in three different places of a web-page at the same time. Instead, one has to choose between these conflicting solutions.

Resolving the conflicting solutions can be done on the ground of attribute information. For example, one of the solutions may be less usable than others or less ethical than others and must thus be eliminated. In the Life-Based Design process reflective resolving between plausible alternative solutions is a normal activity.

Complementary problems are sub-problems which are targeted for different roles in the final solution and have different functions in these roles. They thus safeguard smooth realisation of the final solution. For example, a system for searching a product in an e-commerce service is one problem to solve and paying the product is another. They are not conflicting. They are pieces of the whole, which must be integrated to each other.

The generation and solving of sub-problems, i.e., choosing between conflicting solutions and combining complementary solutions takes the actual design process on a new constructive level. The design process is synthetic and its task is to integrate the solutions into a whole; into the final conceptual design output.

6.3.4 Constructive design: design requirements

In a constructive design phase the accepted TSAs are converted to design requirements. The analytical design process can never be endless, but in some stage the analysis of sub-problems has to be finalised on a satisfactory level, and the integration of the results of sub-problems begins. This means that each sub-problem gets its place in the draft concept until all the problems have been solved to the level of a satisfactory product or service concept.

The final concept is a full description of a system of TSAs, which are integrated to each other. It gives the goal for the actual technology design. It includes information which technology designers need to be able to construct the actual product in a sense making manner, i.e. in a manner that can easily be embedded to the flow of actions in human everyday lives.

The completeness of the constructive design is vital. All too often the information about life is lost in the final concept. If the final concept of the product is not connected in a sufficiently detailed manner to the TSAs and to the form of life of the target group, there may be holes in the design plan. All the deficits might not be serious, but there can also be serious ones.

In any product there are problems which must be necessarily solved. If such problems have not been noticed in the constructive design phase, these problems must evidently be solved by someone in later stages of the product development with no knowledge of TSAs or design-relevant attributes. Often this is the programmer of the application. Consequently there is a risk to implement unpractical solutions to the actual product. For this reason alone it is vital to make the final concept descriptions as accurate as possible from the point of view of the form of life.

The criterion for the goodness of the concept description is in its fit to the actual TSAs and the form of life they are supposed to support. The criterion for the concept description is how suitable it is when it is embedded into the form of life. Thus the form of life and its rule-following actions and relevant factual and value attributes are important along the whole conceptual design process.

6.4 User involvement in the design

As in any human-centred design, also in the Life-Based Design the users should naturally be involved in the design process in different phases. The users' role in the design is to discuss the relevant matters with designers and deepen their understanding of the form of life. This information gathering concerning the particular form of life can be accomplished with the help of, e.g., group discussions, interviews and workshops of people participating in this particular form of life or with the help of ethnographic research. As soon as the design ideas are concretisized and visualized, the users may again give their views about the concept ideas and thus help in the crystallisation of the ideas. This discussion can be carried out with the help of, e.g., focus groups and different techniques of participatory design.

Users' view should be included in the design of ideas and in concept development. The users should bring their view to issues concerning the purchase, usage and even the disposal of the product. This requires user involvement in the very early phase of the design (Dickinson and Dewsbury, 2006; Hawthorn, 2006), i.e., in the phases of the form of life analysis and the definition of technology supported actions. Naturally after the Life-Based Design phase, as the development process proceeds and the focus is shifted on technical implementation, the user input is also needed in testing, e.g., the acceptability and usability of the product prototypes.

In the case of older adults the challenge of user involvement is not in older people's interest towards technology design, as older adults indeed want to influence on what kinds of products and services are developed for their needs (Leikas, 2007). Instead, the challenge is in finding and developing suitable enough methods that would encourage people to bring forth their views of the design and ensure efficient gathering and usage of this information throughout the design.

The participation of older adults in technology design is useful from two angles of view. Firstly, older adults experience technology and adapt it in their own way, which is in many times very different from that of the young. In the design of products and services this tacit knowledge of older people's experience world should be exploited for the benefit of not only older adults themselves but all citizens in the society. When designing only from the perspective of younger people there is a danger that we loose the essential experience knowledge of life that older people have and that is valuable in the information society. The need

for this tacit knowledge increases all the time as in the societies there is a strong demand of understanding entities instead of single matters. This understanding evolves within the course of life and is thus typical for older people.

Secondly, no matter how well a product or service is developed, older adults will not adopt it if they find it somehow complex, obscure, confusing, violating privacy, stigmatizing, or unaesthetic (Leonardi et al., 2008a). This is why it is essential to bring their view in the design and let them have their say in a very early phase of the design process.

6.5 Connections to standard HCD

Life-Based Design stresses the importance or the early design phases, and thus considers design requirements from two viewpoints. Firstly, it covers requirements for concept development. With the help of Life-Based Design it is possible to create product and service concepts and thus specify requirements for concept development. These requirements also guide the product development all the way from concepts to user interfaces.

Secondly, and very importantly, Life-Based Design is concerned with innovation and creation of design ideas, a process that is neglected in many current design approaches. When creating design ideas, understanding people's life should constitute the main motivation for the design. Life-Based Design examines the rule-following actions and facts and values of forms of life and converts them to design-relevant attributes for the design for life. With the help of these design relevant attributes it is possible to examine the relevance that technology can bring to different contexts in forms of life.

What are, then, implications of the Life-Based Design approach to the traditional human-centred design process? How would this approach change the design of ICT technology for everyday use? Firstly, the design should start from strategic studies of forms of life. This very first and essential phase can be called *FoL analysis* and it should support the design in all its phases. As explained above, FoL analysis can be seen strategically different from *traditional concept design*. It is anchored in social and human sciences, and draws from scientific and experimental information on people's forms of life with the help of verified and established methodologies of these sciences. FoL analysis with the design-relevant attributes is thus directed towards strategic management of the design. The generation of design ideas and TSAs aims at making the preferences of the users concrete with the help of technology. Concept design, in contrast, starts in

a situation in which it is already known that a new product is needed, and very often the technology to support this need is already decided. Often it accounts also for previous and competing versions of the product, specifying ideas for the actual product design. Therefore, concept design is closer to technology than Life-Based Design. In fact, Life-Based Design does not focus on technology but on forms of life. It creates descriptions of concepts from the point of view of user's actions, and can thus be seen both as a preparation phase for concept development, and also as an information source penetrating the whole design and development process.

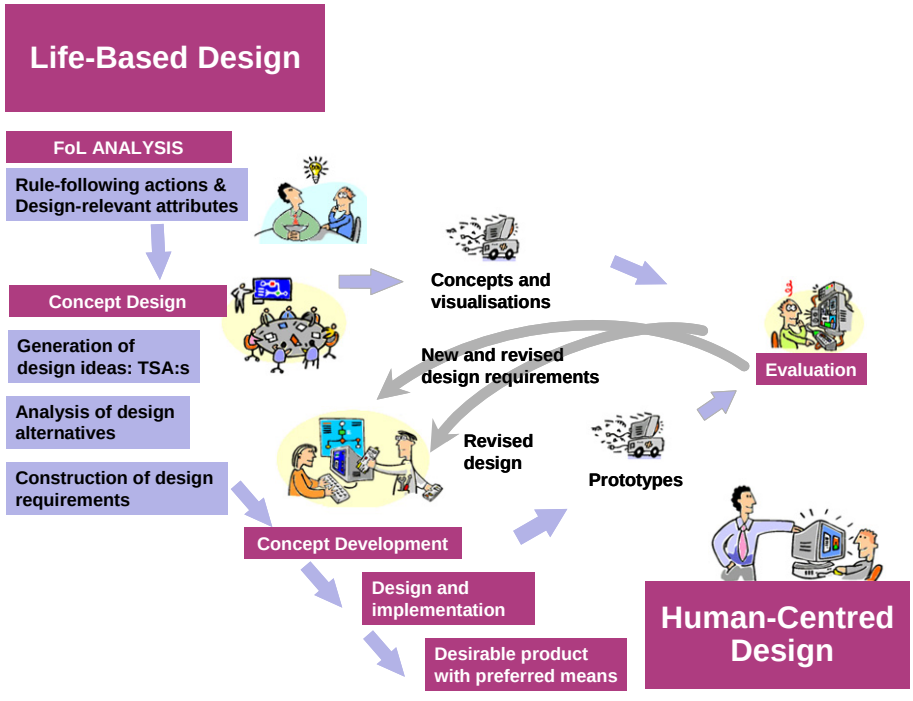


Figure 9. Life-Based Design and its connections to human-centred design (illustration VTT, modified by the author).

In fact, the role of the design-relevant attributes is not only to guide the definition of technology-supported actions, but also to penetrate and guide the whole design and development process. This means, that in different phases of the product or service development, such as evaluations of concept ideas, visualisations and different prototypes, the outcome of evaluation is assessed against the very design-relevant attributes, and the design requirements are refined in accor-

dance with the results of this assessment. Naturally, the size of the design project, the number of different experts and design teams involved and the nature of the design challenge from, e.g., multicultural perspective all influence the iterative development cycle and the role of the design-relevant attributes in it.

In the model above (Figure 9), the information of the forms of life of the users is utilised in the Life-Based Design process and carried along the whole product development process. It supports every phase of the design. The design starts with a FoL analysis, which means research on different rule-following actions as well as facts and values of the forms of life of the target users, and determination of design-relevant attributes based on this information. The technology supported actions are then derived from design-relevant attributes. The phase is followed with analysis of design alternatives and finally of constructing design requirements.

From here onwards the process is more or less consistent with the traditional human-centred design process with concept development, visualisations, state-of-the art research on different possibilities of technology, and finally the iterative product design as described in the HCD standard (ISO, 1999). The research methodologies here should take advantage of the methodological grounds from, e.g., social sciences and user psychology. The design methods should enable and encourage empathy, speculation and communication, and promote dialogue between the designers and the users as well as in the design team (Knight, 2005).

The analysis of the data of the form of life should be based on state-of-the art conceptual frameworks from the social and human sciences. The technology-supported actions are assessed in the light of research on the impacts of different technologies, and the design relevant attributes are set against different possibilities of technology. This data and suggestions and sketches based on them are integrated with different alternatives of technology, and possible marketing information, and modelled into product or service concepts.

The concepts and their visualisations are then evaluated with the target users, modified and finally brought into product design. Following the principles of human-centred design, the product prototypes as well as user interfaces are iteratively tested for user experience with users and relevant stakeholders and finally in real usage environment and situations.

6.6 Final comments: why Life-Based Design?

There are certain cogent arguments for the Life-Based Design. Firstly, human beings should not be seen as extensions or subsystems of technology. Instead, technology should be harnessed to support and enhance the quality of people's everyday life. This can be possible only if the point of view in the design is changed from technology to humans. Secondly, when designing for the quality of life we have to understand people's everyday life and what is relevant for people. Thirdly, relevance in respect to technology can be made visible through values and 'worths' that people have in their life. Finally, values and worths become visible in different contexts. To understand these contexts and to be able to design worth in them we have to understand different regularities of forms of life.

Mere investigation of the elements of form of life is not enough to guarantee successful design outcomes. We need to have well-grounded methods and tools for the design which can utilise our investigations of forms of life and implement this knowledge into the design work. As discussed already, the traditional human-technology interaction research does not consider everyday life as a relevant element in relation to technology development. Of course, certain elements of HCD, such as user participation in the product design processes, form essential and well-grounded arguments. Indeed, involving users already in the design processes of ideas and concepts may no doubt bring a necessary perspective for the development process. Despite of this, it can not carry us a long way in the aim of designing products that would be beneficial in the everyday life and desired by people. In order to succeed in this aim we need to find more holistic approaches for the design.

I have used older adults' forms of life as an example for Life-Based Design. However, besides those of older adults', there is naturally a rich variety of other forms of life, and as I have discussed earlier, older adults' forms of life may differ a lot from many other forms of life. Despite of this, I find the framework of Life-Based Design suitable for all kinds of forms of life, whether those of young people, professionals, or any others. Life-Based Design incorporating forms of life can be seen as a holistic approach which can be applied to the design of any context in life.

A major challenge but also strength in the practicality of the Life-Based Design paradigm is in the multidisciplinary nature of its applicability. The design calls for a multidisciplinary design team, where different designers with different expertise work together. In many cases, unfortunately, designers with different

backgrounds, perceptions, know-how and skills are reluctant in adopting different design policies. To avoid this, training for the usage of the Life-Based Design is needed. Simply, in developing new ICT-services and society we need expertise in humanities. The idea of life based design is to give tools for this kind of thinking.

6.7 Summary

Examining and analysing life should be the starting point for the design. Life-Based Design stresses the importance or the early design phases and is concerned with producing design ideas for concept design as well as human user requirements for concept development. The process of Life-Based Design is an iterative process, which includes defining the design problems, generation of possible design solutions, analysis of design alternatives, and construction of design requirements from accepted design alternatives.

The first step in the Life-Based Design process is to define the problem that the designers want to solve. Secondly, the design plan should be linked with the practical form of life using the form of life (FoL) analysis as a help. FoL analysis can be seen as strategically different from a traditional concept design. It is anchored in social and human sciences, and draws from scientific and experimental information on people's forms of life with the help of verified and established methodologies of these sciences. FoL analysis with the design-relevant attributes is thus directed towards strategic management of the design.

After the FoL-analysis (rule-following actions and facts and values concerning the form of life) it is possible to have design-relevant attributes for the design problem at hand. When a form of life has been investigated, and the rule-following actions and attributes (design-relevant attributes) found, it is possible to think how some of them could be supported with a technology. These target actions are thus called technology-supported actions (TSAs). The technology-supported actions should consist of elements relevant to the generation of design ideas. These elements are the action and its goal, the agent, possible technology, and the context. The knowledge needed in order to make the TSA descriptions can be obtained by analysing the attributes of the form of life.

The third step is the actual design process, in which the design plan is divided into sub-problems and these problems are solved on the ground of the knowledge we have about human beings and their actions. With the help of the model of Life-Based Design it is possible to define accurate problems and concentrate

on designing solutions for these precisely defined problems. The final concept is a full description of a system of TSAs, which are integrated to each other. It gives the goal for the actual technology design. The users have an important role in the design in terms of discussing the topic with designers and deepening their understanding of the form of life.

The next chapter concludes this book. It presents the aspiration of Life-Based Design in the information society and thus places the Life-Based Design approach to the context of life. Different human-technology interaction areas are discussed from the perspective of information society and older adults. With the presented examples it should be possible to understand why a new paradigm, Life-Based Design, is needed in HTI design.

7. Information society with a human face

Why do we need new design paradigms in technology design? What is the aspiration of Life-Based Design in respect to information society? Life-Based Design aims to consider the development of information society from the point of view of humans instead of technology. It aims to enhance the quality of life of citizens and considers technology as one tool for achieving this goal. It argues against leaving human beings as prisoners within the technology that they have themselves created and calls for opening the window to the actual life outside technology. When developed on the right premises, technology has huge potential to support the everyday life of people. On the other hand, if new technologies are designed only from the point of view of promoting technical development in the society the information society does not stand for the welfare of humans but for the glory of technological achievements.

The ongoing technological development significantly changes society and the ways it works. The services of the public sector will mostly be moved into web, and the dependency on the information and communication technologies will increase in different areas of life. Commerce and different private sector activities are increasingly based on the usage of ICT. (Valtioneuvosto, 2008.) Our capacity to control everyday life is increasingly dependent on our ICT skills.

There are many aspects in forms of life which affect hopes towards and adoption of technology. To the ageing people of today the technological development and its becoming a commonplace phenomenon is not a new issue. In the course of a lifetime, such appliances as radio, TV, telephone and many domestic appliances, which are taken for granted by today's young people, have found their way to people's homes. The information society has speeded up the change. However, the structure of consuming has changed, and the artefacts have become increasingly complex. New technologies enable a 24/7 society. This kind

of e-society changes our conception of time and our time management (Hämäläinen, 2006).

Ageing people have great expectations towards the emerging technologies. These expectations have their origin in different forms of life and the needs associated with them in different areas of life (Leikas and Penttilä, 2007). For example, the consciousness of ageing people over their own well-being and health has increased. An increasing number of ageing people take care of their own fitness and health (European Commission, 2007). The needs and expectations in the area of individual and social well-being create large markets for mobile services, the Internet and TV. Therefore, when developing information society, we should consider how ageing consumers' rights and needs could best be met in e-environments.

In the next sections I will discuss different human-technology interaction areas from the perspective of older adults. With the help of these examples it should be possible to understand why a new paradigm, such as Life-Based Design, is needed in HTI development. I will first discuss the necessity of gaining the feeling of self-efficacy in the usage of technology and the importance of guidance and training. These aspects, however, are of no use unless we understand the human-technology interaction as a whole. Guidance and training are essential, of course, in the adoption of products and services, but first and foremost there have to be meaningful solutions for specific problems in people's lives. Training and the ability to use products does not count if the applications do not include any 'worth' for their users. Therefore, I will continue by introducing technology from the points of view of coping in life, supporting human relationships, significant roles, the exercise of agency, and independent living, as well as from the point of views of enabling privacy, autonomy, trust and control, and ethicality of technology adoption.

7.1 Supporting self-efficacy

The feeling of self-efficacy is important when using any technology. It arises from the experience of competence, i.e., from the feeling that I can and know how to use a new system or device. Self-efficacy is an essential factor in older adults' coping in life. This is why the products and services should be easy to use and the usage information clear enough.

The feeling of self-efficacy in using technology is associated with everyday experiences, which can be influenced by, for example, work experience, educa-

tion, income, locality, health, disabilities and gender. These experiences are also influenced by complexity and versatility of the technology and the support facilitated by social networks (family members, service providers, technical support of the work place, etc.).

When considering actual devices and appliances, user interface is the basic factor which either increases or decreases the feeling of self-efficacy. In the previous chapter I already highlighted the difficulty of older adults in using modern user interfaces of ICT appliances. As pointed out, the reason for difficulties in using technology does not always arise from poor usability only, but from many other factors, such as previous experiences in the usage of technology. This, in turn, is connected to the importance of consistency in operation logics of user interfaces. This means that the way of using devices and applications should be familiar and somehow in concordance with earlier experiences. Indeed, for many older people with decline in cognitive ability (and with visual decline as well), consistency in the user interface is one of the most important aspects in using different devices.

In the following I will discuss the basic elements of ICT devices and appliances from the perspective of supporting the feeling of self-efficacy in their design. Most of these aspects here were originally introduced by Gill (2004) in "Access-Ability".

7.1.1 Controls

The term 'controls' is a generic term for describing human input to products and devices. In everyday activities people interact with a wide range of switches, keypads, knobs, instruments and devices – operating televisions and radios, telephones, coffee makers, washing machines, microwave ovens, ticket machines, and computers. When considering the needs of older people through the aspects of their forms of life, there are many things that can be taken into account in enhancing the easiness of use of devices and thus the feeling of self-efficacy and coping. For example, it is important to understand that having poor manual dexterity or weak grip and little or no vision can make the usage of different devices and tools difficult or even impossible. Many hand-held devices, such as digital cameras, palmtop devices and mobile phones are often made of slippery material, which makes it difficult to get a good grip on them. Also, for a person with low vision it may not be obvious where the controls of a device are located if they are not in a standard position. It is important that controls are grouped in a

logical manner, and that they can be differentiated by shape, size and colour as well as position. The layout of controls should reflect the sequence of operations (e.g. left to right, or top to bottom). Consistency of layout is essential for users not familiar with a particular terminal. When the same control is used for a number of different functions, older users can easily become confused. Often it is preferable to have a large number of buttons laid out in a logical manner rather than use multi-function controls. (Gill, 2004.)

Qwerty-based keyboards are a relatively new feature in some mobile phone models which should make it easier for older people to figure out the array of the keys. Although people face many problems with the Qwerty keyboard (Noyes, 2001) this type of keyboard seems to be familiar to people from other relations with technology and is thus expected to be easier to use in mobile phones also, compared to other existing input modes of mobile phones. It looks as if that this type of keyboard would dominate the market for years to come.

The optimum spacing of keys on a mobile phone handset depends on whether the user uses a thumb or finger to press the keys. Young people tend to use their thumbs – in Japan a notion 'thumb culture' is used to illustrate the current mode of interaction (Glotz et al., 2005) - but many older people prefer to use a finger, simply because the thumb usually is too big for pressing one key at a time and old people are used to using their fingers more than thumbs in pressing keys. Should a person have a difficulty in making precise finger movements, guarded keys could be useful. Also, a dial-out buffer memory enables users who are slow in dialling to avoid being timed out. In addition, visual ringing signal is essential for people who have low hearing. Visual signals incorporated in the terminal are often not easily seen and are mainly of use as a reminder of line status. The user interface should be designed so that external lights or a vibrating pager can be triggered by the phone. (Gill, 2004.)

7.1.2 Screens

On most terminals the visual instructions on the screen are the main guide for the user. However, many older people experience difficulties in reading standard text or symbols even with spectacles and with good illumination. There are a large number of factors that determine whether reading the screen will be difficult or easy for older persons. The size of type, brightness and contrast are important in helping to read text on a screen display. Usually, in most information appliances the display is too small for older people. Take, for example, hand-

held Chip and PIN terminals. Because of the small size it is hard to distinguish different elements on the display, and it is even harder in dark environments or in a very bright sunshine. Larger screens and clear graphics with strong contrast between the characters and the background all help improve legibility. Text and icons should be positioned in a way that they are not obscured when the controls are being operated. Also, the status of the device should not be indicated by colour alone since many people have problems in distinguishing red/green or blue/yellow. (Gill, 2004.)

Touch screens can eliminate the need to press keys on complex keypads, and they are becoming more and more common in different applications, despite of problems of parallax, user fatigue and the greasy surface that quicky result from frequent use. For older people, touch screens should be as large as possible so that large text can be used. Larger screens also allow more space to position text and active areas. It should also be possible to adapt the screen for individual users by increasing the size of the characters on the screen. There should be high contrast between touch areas, text and background colour. For many older people, colourful patterns or pictures in the background are disturbing and can make the screen difficult to read. For people with hand tremors, the active fields of the touch screen should be as large as possible and separated by “a dead area”.

Pictograms, icons and symbols appear to be used with very little thought as to how people might understand their meaning. Wherever icons are used they should be easy to understand, otherwise they will add to the difficulties of using controls. This applies particularly to devices that a person might encounter only occasionally and operate them without training or other instructions.

For situations with poor viewing conditions the information can also be provided with audio output. Audio messages are the most appropriate when an immediate response is required with less reliance on referral to the message at a later date. People with low hearing often have a difficulty in understanding synthetic speech output since it tends to have less redundancy than natural speech. Thus a facility to repeat the speech is essential.

7.1.3 Keyboards

The keyboard is another type of input device that is deeply-rooted in our everyday life. Once one has learnt to use a keyboard, it is easy to use another should it have a consistent layout. Consistency in the layout of keyboards is important, especially for people with low vision. There are currently two different layouts

for the numeric keys: the telephone layout and the calculator layout, and ISO9241 (ISO, 1998) allows both layouts. It is recommended that the telephone layout be used in public access terminals (Gill, 2004; Noyes, 2001). As older people tend to have rigid finger joints, the keys of the keyboard should not be too small and there should be enough spacing between the keys.

The keys should be positioned in a way that makes it easy to distinguish between the main numerical keys and other function keys. When a person has a difficulty in making precise finger movements, large keys that are recessed or guarded can help ensure that no wrong key is pressed. Variation in the size, shape and position of function keys will help differentiation. Enlarged raised keys enable persons with poor dexterity to press the correct key. A concave key shape will also help fingers to stay in place. Ideally keys should be internally illuminated when the terminal is waiting for input from the keypad. Auditory feedback in the form of sounds such as ‘beep’ or ‘click’ when a key is pressed is helpful to many people and enhances feedback and subsequently performance. Also, tactile indication can be provided by a gradual increase, followed by a sharp decrease, in the force that is required for actuating the key, and a subsequent, more sudden increase in the force beyond this point for cushioning. (Gill, 2004.)

Speech input keying is a useful means of providing a hands-free facility for persons with hand tremor who experience difficulties with manual keying. A sensitive microphone will help people with quiet voices or with restricted neck and chest movement that makes speaking difficult. (Gill, 2004.)

7.1.4 Smart cards

In the ideal world, systems will automatically learn from the way the user controls them and modify the user interface to optimally meet the user’s needs. A practical solution close to this is smart cards which are able to carry information that can make devices more user friendly for older people (Gill, 2004.). A smart card is a credit card sized plastic card incorporating an integrated circuit. This circuit holds information that can be securely and accurately read by all sorts of terminals. Smart cards are able to carry larger amounts of information than magnetic stripe cards and thus allow making devices much more user friendly than before.

Smart cards can be used in a growing number of applications, such as public transport, credit and debit cards, access control, health records and prescriptions, electronic voting, car parking, membership (e.g. libraries, clubs) driving licences, identity systems, telecommunications, and electronic purses. For older

people, a smart card can carry information that tells a terminal, e.g., to allow the user more time, simplify the choices, use larger characters for people with low vision, and use audio-input for non-confidential information. A contactless card working at a distance could help those who have problems placing a card in a slot.

7.1.5 Biometrics

Many cards use a four-digit personal identification number (PIN). Many older people have problems in remembering the four digits in the correct order, and are likely to prefer alternative biometric systems for authentication. Biometrics permits automatic identification of an individual based on his or her distinguishing physiological and/or behavioural characteristics. Biometric identification involves comparing the biometric characteristic of a person with a database of templates to find out who the person is, whereas biometric verification is where the template is compared to the one supplied with the claimed identity of the person. Some biometric systems cannot do identification but can only verify the claimed identity of the person. For an older user, it should be easy and comfortable to use the biometric identification system. Many might prefer methods which do not require physical contact between the individual and the device. (Gill, 2004.)

Biometric technologies include such input methods as facial recognition, fingerprint systems and iris recognition. Facial recognition can have an unacceptable level of either false positives or false negatives. Technically it is best in cases where it should be determined “if this is the same person” rather than “who is this person”. Thus it is an appropriate technology when used with a secure token such as a smart card. From the users’ perspective its non-intrusive nature is an advantage and users are likely to accept such a system if it can provide a decision quickly, and is seen to protect their interests. (Gill, 2004.)

Fingerprint systems are good, generating a low number of false acceptances, but can be problematic for those with damaged fingers or with prosthetic hands. Iris recognition is a secure system, but the user has to position the eye in a certain relation to a camera. This can be hard for users who are very tall, very short or using a wheelchair. There are also obvious problems for people with a visual prosthesis. In addition, some ethnic and religious groups may consider such a system unacceptable. (Gill, 2004.)

7.2 Guidance and training

One cannot emphasize enough the importance of guidance and training in relation to technology and gaining self-efficacy. People, and especially older adults, need tailored training in the usage of products and services (Fugger et al., 2008). Product or service design should not only include design of functionality, reliability of operation, easiness-to-use and security. Already in the design phase it should also be considered how the users are going to learn to use the product or service, i.e. the design of learnability must be considered as well (Laakkonen, 2006). In the best case the user interface of the product is so intuitive that one needs not to consider how it is used (Norman, 1993, 2004). For example, the looks of the hair dryer tell that its handle is made for grasping. Bringing intuitiveness to ICT appliances is not that straightforward. Designing learnability is more dimensional and calls for understanding the basic functions of human mind and learning processes.

The designer's responsibility for the product does not end in the phase where the product is finished. Designing aspects of learnability to be integrated with the actual product is only one part of ethical design of learnability. Another significant part is to design how training and guidance of the use of the product will be organised for the product on the market. If the designer does not commit her or himself to these issues, (s)he delegates the ethical responsibility to someone else.

For example, in the design of mobile phones this responsibility has been moved away from the actual design. The sales persons of mobile phones are often young people whose experience of phones and technology in general is very different from the experience of older adults. No doubt these persons wish to sell the best possible phone to an older person, but really do not think what this person might actually need. Usually this results in a situation where an older person gets a fancy phone with many unnecessary functionalities. Consequently, the phone might also be difficult to use and in many cases an expensive one. The problem here is, that the older person is not necessarily capable of precisely expressing what (s)he actually needs. This is due to that person's lack of knowledge of different possibilities and low ICT skills.

In many cases children and grandchildren like to buy a mobile phone to the grandmother or grandfather. They also might think that it is good to have a small phone which would be easy to carry along and thus provides an element of safety when the older person is outside home. In the workshops of VTT's Idea Movement for Ageing Citizens (Leikas, 2007) it was noticed that older adults

are not that keen on small phones but instead would prefer a larger one that would be easier to grasp and easier to use. They don't mind carrying along even a substantially large phone provided that the phone has a large display, tangible controls and is easy to grasp.

The angle of view of older adults to technology is very different from that of young adults. An older person may get to hold, e.g., a mobile phone for the first time in her or his life at the age of 70. This is why the training for older people to use technology should be based on premises totally different from those of younger people. The operation logics of many devices of modern technology are very different from the operation logics of devices that older people are familiar with. Thus, the question here might even be about the change in the whole way of thinking.

From the viewpoint of learning, the essential changes when becoming old are related to physiological change and experiences in life (Kuusinen and Paloniemi, 2000; Laslett, 1996). In addition to changes in sensory system, earlier learning experiences in life, in either formal or informal situations, have an influence on how people are able to learn new things (Rauste-von Wright and von Wright, 1994). Also, when older people are in question, learning is coloured by an increasing amount of presuppositions and rejection (Jarvis, 1992).

The most essential changes in sensory system in relation to training are changes in vision and hearing and motor ability. These should be taken into account when designing training situations. For example, a peaceful and a quiet space with sufficient lightning have a positive influence on learning experience and make it easier to focus attention (Kuusinen and Paloniemi, 2000). Also, the attitude of the tutor towards the trainers and the training situation is significant in successful learning. The tutor should proceed evenly, notice all those training and have breaks in regular intervals. Possibility to proceed at one's own pace and to discuss difficult questions, along with sufficient training, facilitates successful and efficient learning.

The tutor should talk explicitly and use a lot of illustrative material. In case of possible memory disorders of some people undergoing training it is essential to discuss subjects from different aspects so that the trainees would learn about the issues instead of merely remembering them. With computers, one can do different things to enhance learning. For example, strong contrasts in colours and forms make the distinguishing of different issues on the screen easier, and enlarging the font size facilitates perceiving the text. Increasing the illumination

of the screen and decreasing the operating rate of the computer can also make learning easier. (Kuusinen and Paloniemi, 2000.)

A significant factor in training of older adults is using peers as tutors. It is easy for an older adult to approach a tutor of the same age. An aged tutor knows the needs and learning possibilities of older adults. In fact, peer training has been successfully carried out in, for example, Internet training for older adults, and one would wish that this type of training would increase.

The instructions on the use of a product or system should be written from a non-technical user's point of view. Therefore, technical designers of the system or device should not be the (only) persons to write the instructions. The instructions should be tested on a range of potential users and verified according to their feedback. It is also good to deliver information in different ways. Alternative formats for written instructions can be, for example, audio tapes and large print CDs, especially for people with low vision.

7.3 Supporting coping in life

Technology can help people in coping in life in many different ways. Unfortunately this opportunity has not been fully appreciated by product developers and service providers. So far, ICT has provided new, promising opportunities in the area of fitness support (Väätänen et al., 2007.), nutrition and weight control (Pärkkä et al., 2000), and temperance. There are various kinds of educational multimedia applications for these purposes, which can give personalised feedback to their users.

New media have a central role in promoting coping in life. With the help of new interactive technologies information can be obtained quickly, conveniently, in an encouraging manner and confidentially, and solutions can persuade people to improve their lifestyle together with other people. The basic elements of applications for coping in life include awakening of an individual's own will, motivation and determination, receiving expert guidance and information, and gaining social and peer group support. The grounds for these applications are in anonymity and self-help. In this area Internet services have proven to be especially successful since they are highly accessible, affordable, and above all, discreet, making them quite appealing to people who want to avoid being labelled, for example, as problem drinkers. Mobile technology has been seen as a good solution in this area also: with the help of mobile solutions it is possible to obtain instant peer group support and also offer group support tools for persons on the move.

In the area of memory functions, technology development has been harnessed in many ways to train and support this area. For example, brain games have attracted a lot of interest. Although there's no scientific proof yet that using tools like computer games or any other mental training devices could train the brain, brain training games entertain now a new generation of computer users: healthy older adults who have not been too interested in computer games before (Leikas and Lampila, 2008.)

ICT can help people with memory problems in many ways. For instance, electronic memory aids have been successfully used as a compensatory approach to provide reminders to individuals with possible memory problems (Wilson et al., 2001). With the help of ICT technology it is possible to support a person in keeping track of time, duration and details of different activities. With a well-designed system people can schedule and reschedule activities while technology keeps track of the details and reminds when it is the time to undertake a specific activity. Often people also want to be reminded not only of what they have to do but *why* they have to do it (Inglis et al., 2003.) An example of this is, for example, a medication package which sends information to the person's mobile phone or e-mail about taking the medication.

Mobile phone technology is currently being integrated into PDA devices, and new technologies and devices are frequently appearing in the market in this rapidly expanding area. The potential for the use of this technology as a memory aid is enormous, as it allows the development of truly interactive systems which can keep the memory-impaired person in contact with other people. These systems could include remote access to the devices provided through a base station, which could be accessed remotely from any PC connected to the Internet. This would allow reminder messages to be entered into the system from a large number of suitable locations at any time of day, and thus be completely independent of any third-party, such as a call centre. Hardware requirements for memory aids include at least a visual signal, such as a flashing light, an alarm, voice recognition and portability. (Inglis et al., 2003.)

A challenge for technology design is that people with memory disorders would best benefit from devices and technology that are already familiar to them. For people who have learned the way of using specific equipment before they are confronted with memory problems it would be most beneficial to use this same kind of user interface in new devices, also. As an example, using a safety telephone with push buttons was found to be extremely difficult for persons who had been using the old-fashioned phone with a rotary disc and who

were experiencing memory loss. In fact, it has been noticed that, in general, people trained to use one type of mechanical device may have a difficulty in adjusting to the digital input (Noyes, 2001). Had the new phone been designed in an old-fashioned way – although with the new technology inside – it would have been much easier for those people to use it (Leikas et al., 1998).

There have also been attempts to develop an Internet service for persons with memory disorders. These attempts have failed due to difficulties of understanding the form of life of these people. When memory disorders progress, the persons are not be able to use any system which requires them to remember addresses, user ID's or passwords. For people with memory disorders, the telephone is still, to a certain degree, one of the best technical aids for communication. It is a familiar device, and the person knows for a long time how to answer the phone. In fact, when thinking of technology from the point of view of coping in everyday life, there should be a service where one could get all the necessary services from one single phone number. A spoken word and voice can deliver a lot of reliable information, unlike, for example, a video connection, which might make people feel nervous and pay attention to irrelevant factors, such as their appearance.

7.4 Enabling human relationships

Already Epikuros knew that the basis for a good life is being together with friends. He built a big house and invited all his friends to live in it. (Diogenes Laertios, n.d., trans. 2002.)

Technology development should focus more on supporting and enhancing social relationships of older people. We should strive for reducing risks for loneliness and social isolation by developing technology that would enable contacts and social interaction between people. In addition to being targeted for a person living alone at home, this kind of technology could be targeted for, e.g., to family caregivers, community groups, self-help and mutual aid groups, peer and professional outreach services, neighbourhood visiting services, and telephone support programs.

Social interaction with relatives and friends becomes more and more important in old age. However, running daily errands and maintaining close contacts with people may become difficult with the declining sensory and motor processes. Technology may offer help in this. Consequently, the expectations for new technologies are high (Leikas and Lehtonen, 2007). Technology for main-

taining communication and social relationships already exists, but we need easy-to-use versions of it for older adults.

For older people, the 'worth' in communications technologies is in that they allow practical use of the technology (Melenhorst, 2006). One of the practical needs is keeping up social relations and meeting friends and relatives. Technology development should strive for enabling contacts and social interaction between people, thus reducing risks of loneliness and social isolation. Meeting other people and being able to share memories and experiences with them is remarkably important to humans. Through the feedback received from social contacts with others, people can reflect upon their identity and maintain it at a level which promotes psychological well-being (Gollwitzer et al., 2000).

With the help of ICT technologies it is possible to socialise with other people. For instance, Internet-based applications can help people form social networks over geographical distances, providing new communication modes that offer flexibility in interaction. Shneiderman (2002) points out that these technologies supporting relationships between people have been successful as they provide people with alternative ways of doing what they already love to do, namely communicating. They augment people's ability to communicate and fit in with a value system that treats communication and relationships as important. Out of these technologies, mobile phones are becoming perhaps the most preferred media for contacting other people.

The development of mobile phones opens additional new possibilities and forms for spontaneous and real-time interaction. It has been argued, though, that rather than enabling more social relations, mobile devices enable more intensive relations with already existing social contacts (Vincent and Harper, 2003). The adoption threshold may be lower with mobile phones than with other communication means. The essential problem with older people, i.e., the price of services, is no longer a problem, as cheap telecommunication prices enable people to maintain their network. (Kopomaa, 2000.)

One important possibility is virtual communities, in which older people can communicate with others by means of the Internet. Grandparents can, for example, virtually lunch with children and grandchildren living abroad. Also, by means of a portal specifically directed to senior citizens, older adults can communicate together in various discussion groups and, for example, play games with their mates around the world. Through electronic connections it may be possible to find different community practices such as electronic neighbourhoods. Aging people are interested in on-line communities that offer an opportu-

nity for real community activities with people of the same age (Mittilä and Antikainen, 2006). On the other hand, they are very worried about their privacy and have a need to separate private and public social life from each other. On one hand, they are afraid of unnecessarily disturbing other people and, on the other, fear opening themselves to others too much (Leonardi et al., 2008b).

Internet games have not yet become popular amongst older adults, although multiplayer games offer possibilities for social interaction. In a multiplayer game, communication mainly consists of multidimensional interaction where several people interact with each other at the same time. The multidimensional approach is enhanced into a collective activity when the application allows the group members to concurrently influence a common task (Leikas et al., 2006). In a multiplayer game, social interaction can, at its best, include elements that enhance social pleasure through group activity and team work. In fact, the need for social activity is often the main trigger for participating in a multiplayer game. The reason why older adults have not taken these games yet as their own is twofold. Firstly, they are played through the Internet or with a mobile phone, both of which are equipped with difficult-to-use user interfaces. Secondly, there are no multiplayer games, which would interest older adults, on the market. Most of the games are still some types of battle games targeted at younger population.

The issue of replacing social relationships with technology has many times been brought up in discussions about older adults and technology. This is of course possible in cases where the already few contacts of a lonely person are replaced by, e.g., new solutions of ubiquitous computing and ambient intelligence. However, technology should be seen also as a facilitator for social networks. It cannot remove isolation, but it can remove the feeling of loneliness by creating possibilities for social networks for those people who, for example, are not able to leave their home due to a motor disability. This is why each case should be examined from the point of view of individual needs in relation to opportunities provided by technology.

7.5 Promoting significant roles

Older adults can have several roles that are meaningful to them as well as to other people. These can be, for example, the role of a parent, a grandparent, a family caregiver, an influential person in society, and a member of a circle of friends as well as of different clubs and communities. For example, grandparents serve an important role (actually many roles) in the lives of their adult children

and their grandchildren. Older adults have also other sources of identity, such as friendships and organisational activities which relate to life satisfaction (Hooyman and Kiyak, 1996). Many older people contribute enormously to the solidarity of their communities. This contribution and the social resource it represents should be recognised in the society. Older people must have the opportunity to remain involved with others and engaged in meaningful activities, interactions and roles despite of any limitations of physical or mental capacity. This possibility should be guaranteed for people in their third age and also in their fourth age.

Technology can help in retaining different social and societal roles and responsibilities. For example, the possibility for older people to contribute to the quality of life of family through being involved in the life of their grandchildren can be supported with ICT, as explained in the previous chapter. The features of mobile technologies include ubiquitous online access and, therefore, potential for immediate reaction. This feature is especially useful in a situation where information, guidance or support to or from other people, for example, grandchildren, is needed. Furthermore, the ubiquitous, always-on features make it possible to awake the interest of a person when appropriate.

Technology for older adults should not only be targeted at the design of technical aids for compensating the decline in functional capacity. It should be applied to support the strengths of older people and to facilitate their participation in society. The knowhow gained during the course of aging is a remarkable asset which should be utilised in the society in different ways. Older people have tacit knowledge of life, which is meaningful and beneficial for the whole community. This is why technological solutions should be facilitating the usage of this knowledge for the common good and increasing the role and participation possibilities of older adults as members of society. For example, technology for community and civil activity should be developed so that older adults could take care of each others' wellbeing and do this in a manner they prefer (Leikas and Lehtonen, 2007). All in all, technological innovations should be targeted at supporting participation in community and decision making, at the role of a grandparent, and at developing the near environment of people.

One possibility to participate in common decision making with the help of technology is remote electronic voting. This means voting that takes place by electronic means from any unsupervised location. Implementation of e-voting should be based upon the principles of flexibility and choice, ensuring that voters are not restricted to one preferred method but can choose the method of voting that most suits their preferences. To ensure that older adults can use these

electronic facilities, it is essential that user interface design is based on the needs of older people. Ballot machines are likely to be used extensively in the future supervised locations. It will be important to ensure that older people with possible visual and cognitive decline can use ballot machines without difficulties. For example, easy operation of touch screens and the possibility to position the terminal screen at a suitable angle will reduce accessibility problems. Also, as people expect their votes to be private, it is important to ensure that the voter feels comfortable and is confident that the system is secure. (Gill, 2004.)

Another essential perspective to maintaining social roles is the wish of older people to take care of their friends. Older adults hope that mobile services could open up possibilities for friends to take care of each other daily. Mobile telephone could, for example, send a message to a specific friend telling that the owner of the mobile has woken up in a good condition and began the daily errands (Leikas and Lehtonen, 2007). The service could be an automatic and fast signal to a friend that everything is in order.

Mobile telephones, the Internet and digital television are all potential media for supporting different roles in people's lives by providing them with greater access to information.

7.6 Supporting the exercise of agency

Interactive television is modern technology that can offer many possibilities for keeping up and enhancing one's creativity and uncompelled agency. It can offer a medium for, for example, introducing one's travel experiences, cultural activities, club events or other personal projects through photographs and videos to others. In addition to offering a possibility for creating personal programs and presentations, new interactive television services can deliver important information and services, linked with the Internet and e-mail, allowing users to download information and respond and carry out different tasks. For example, e-learning can be made possible through interactive television.

E-learning is distance learning using electronic media. These include, in addition to digital television, computers, the Internet and intranets. Learning material can be accessed from the web or CD-ROMs or via a computer. Teachers, tutors and learners can communicate with each other using e-mail or discussion forums.

Being today's main media for information and entertainment, television is already familiar to everyone. Many older people are reluctant to use personal computers but would be prepared to use interactive television to obtain and share

information. However, the current systems for using interactive television are not very accessible. For example, filling in forms is not easy, and there is also a lack of appropriate help systems if a person does not know what action to take next (Gill, 2004).

In using interactive digital television, older adults face the same problems that occur in connection with user interfaces in general, as already discussed. The television is used with remote controls, and older people with poor manual dexterity and decline in vision and cognitive capacity can find accessing television with small control devices very difficult. In addition, most people need to use many different handsets with different operation logics to control the different modules of their TV-system, such as the digital receiver, the video, the CD recorder, and the television itself.

Accordingly, the operation logics which require users to be able to use remote controls with an on-screen display of the digital television are difficult for many people. In addition, the user interfaces for the interactive digital television are mostly based on the conceptual models of keyboard-based personal computer systems which are not familiar to many older people. Together with the original TV remote controls they are difficult to comprehend and use. The difficulty of adapting the conceptual models of computers to television can be seen also in the divergence of the viewing distance. Contrary to computers, most people view television a long distance from the screen. Because of this, in order to operate interactive television controls, the features on the screen must be easy to read. The requirement for pressing the buttons on the remote control and watching the screen at the same time can also be difficult for persons with age-related decline in vision, as the ability of the eye to focus at different distances decreases. (Gill, 2004.)

Bluetooth is an example of short-range wireless technology that can link appliances and devices together, so that control and communication can be managed remotely. It can offer useful applications for people with a declined functional capacity. For example, small devices with tiny knobs, such as mobile phones and pocket calculators, could be controlled from a separate keypad, appropriate to the user's needs and connected via a Bluetooth link. Applications like this become more and more important, as the mobile phone is replacing, e.g., the remote control for televisions and recorders and providing an interactive channel while connecting to the television via Bluetooth. (Gill, 2004.)

7.7 Supporting independent living

Most people like to live in their own homes as long and as independently as possible. Often, the inhibitory factor for this is the safety of a person. Feeling safe is one of the basic areas in coping in life and, e.g., one of the basic needs in Maslow's (1954) hierarchy of needs. Facilitating and enhancing one's personal safety is one of the central areas in which older adults wish to be supported by technology (Leikas and Lehtonen, 2007; Leikas and Saariluoma, 2008b). The need for safety is related both to activities inside home as well as outside home.

ICTs and ambient intelligence have the potential to deliver extended support and care in the home environment by seamless integration of different technologies. The technologies are now available to allow wireless communications, security services, as well as monitoring and alarm systems. These smart housing technologies can provide valuable support in the daily activities of older people. The advantages of wireless systems are that devices and terminals can communicate with each other without the need to be physically connected. When leaving the house or the apartment, the wireless system can report, using a verbal description or visual display, whether electrical devices such as cookers were left on, or whether doors and windows were left open.

Telemedicine and telecare are technologies that could support independent living of older people who need health care support at home. These technologies can open up better levels of information, communication and interaction. People can be connected with health care specialists through the use of the Internet and e-mail, and video connections enable health care personnel to advice their customers at a distance.

Personal alarm system detectors can notify a person with, e.g., heart disease about emergency situations, and the information can also be delivered to relatives, friends or an emergency service centre. An example of such design is an unobtrusive wrist band which integrates telecare alarms with health monitoring in one single device (Paavilainen et al., 2005). The device includes an intelligent social alarm system with a panic button and sensors for the measurements of movements, temperature and skin conductivity, providing automatic alarm features and continuous monitoring of the user's activity. The integration of alarms with activity monitoring promotes independent living and the possibility to stay longer at home and thus significantly improves the motivation of older people to use the device during the daily life. Another example is a gesture pendant, a wireless device worn around the neck. It includes motion sensors and a camera

which recognises, with the help of infrared illumination, a simple set of hand gestures (Mynatt et al., 2004). It lets a person give commands in the form of hand movements. For example, gestures can be used to close the curtains, lock the doors, open the front door, and so on. This device, too, can take commands and monitor the person's physical activities and request help in an emergency.

An example of the design for an exact and concrete need is a fire detector which shuts down the electricity and water of household machines before any damage can occur. There are also many possibilities to look after the person's safety outside the home with the help of, e.g., GPS (the Global Positioning System), together with a mobile phone, which can inform about the position of the person to, e.g., a family member.

In these examples technology reacts automatically in risky situations by alarming help on behalf of the person. This is meaningful for any older person but especially for people with memory disorders. Safety risks are often the biggest problem preventing person with memory difficulties from living alone (Leikas et al., 1998). The concern over the person not managing alone also often causes continuous uncertainty and much unnecessary work for the relatives or other fellows.

A smooth way for the family to check the situation of an older person living alone is, for example, an application called the Digital Family Portrait (Mynatt et al., 2004). It is an in-home monitoring system that informs family members about an older relative's daily activities, health status, and potential problems. It also offers information about patterns of activities over a certain time period. The Digital Family Portrait creates a visualization of the older person's day at home from available sensor information and displays the information to a family member in a different location. Various sensing technologies (such as radio frequency-badge tracking and computer vision) can gather information about the individual pictured on the display and integrate it into the interface.

These examples show that understanding the regularities of a particular form of life, in this case that of older people who face troubles in managing in their own home, allows the targeting of design activities to meaningful issues. Worth is here precisely the added value (in fact many added values, such as the feeling of independence and safety, a prolonged possibility to live at home and a nice-looking device) it gives in practice to people who are participating in this particular form of life.

When emphasizing independent living we should remember that each one of us is in need of support every now and then. Thus, although the aim of technol-

ogy development would be to facilitate independent living, one should not examine older adults only as consumers but also as people who may need support in different areas of life (Pieper, 1997). Emphasizing such ethical principles as autonomy and privacy cannot mean that an older person would not need support in adopting and using products and in the decision-making concerning these things. In this respect, the social networks that older people have, such as friends and home care personnel, can at their best be very sensitive in perceiving ethical problems related to technology usage.

Smart home technologies should be introduced to people already when the decline in their functional capacity is only partial. This is important, especially in case of people with memory disorders who would benefit from technical devices in the early phases of memory loss but would face severe difficulties in learning to use new devices were these to be introduced to them too late. Another fact that supports early adoption of smart home technology is that the relatives might be against the idea if the technology were to be introduced to them after they already had been worn-out with taking care of the older person and not capable of receiving the information concerning technology anymore. Usually, a nursing home placement is the only conceivable solution that they can think of at that point, anymore.

7.8 Enabling autonomy, privacy, trust, and control

The quality of life of older people is largely determined by their ability to maintain autonomy and independence. *Autonomy* is the perceived ability to control, cope with and make personal decisions about how one lives on a day-to-day basis, according to one's own rules and preferences (WHO, 2002). It is the basic element of human rights which should be seriously taken into account when designing technology for humans.

Autonomy is strongly related to coping in life. Older adults, like any other citizens, should have the right to choose what kind of technology they accept in their everyday life. The choices may relate to the quality of technology, the amount of it and the purpose of its use. However, in the case of older people, the consolidation of autonomy and care is an ethical issue that often comes up. These problems are most visible in the case of people with memory disorders. For example, every person has a right for privacy, but when a person has an impaired memory, it might be difficult to perceive what is the best for her or himself.

Other focal ethical principles in developing technology for older people are the issues of *privacy* and *trust* (Diller et al., 2003; Kaasinen, 2005; Rauhala and Topo, 2003). In order to efficiently serve citizens in the society, technical applications and systems increasingly collect private information about people. People have to be able to trust that this private information in different systems and services is protected and that no-one can use this information (such as a personal code or account information) in a wrong way. In case of smart cards for example, users need to be confident that the system will reliably and correctly identify them while not permitting access to other users.

The issues concerning privacy are perhaps most visible in cases where it is possible to monitor the user of technology (Knies and Bronswijk, 2008; Rauhala and Topo, 2003). For example, when the technology is used for supporting the independent living of a person with memory disorders, one might be forced to choose between privacy and safety of the person. For instance, the relatives of an old person may be faced with a situation where they either have to accept a monitoring system at home to monitor the person or alternatively place the person to a nursing home.

When discussing the privacy of the user we should consider at least the following issues (Topo et al., 2003):

- Only very essential information about the user should be gathered.
- The user should be able to easily verify the information about her or himself.
- The user should be aware of the span of the storage of information concerning her or himself, and this span should be abided by.
- The information gathered for a specific purpose cannot be used for another purpose without the permission of the user.
- All information gathered during the usage of a service should be considered as private (except in case of suspecting a serious crime).
- The user should be informed about the content of the data gathered during the usage of a service and for what purpose and how this data is exploited.
- The user should be able to easily cancel her or his permission of the gathering and usage of information related to her or himself.

In a study concerning safety alarm systems for people with memory disorders (Leikas et al., 1998) the question of privacy became concrete in a form of safety

alarms. In a risk situation a safety phone opened automatically a speaker connection between a contact number and the older person's home without the person actively influencing this. With the help of this connection it was possible to get information about the situation at home. According to the researchers, the benefit that the system brought to the person in question and the family members and relatives in terms of increased safety was much more valuable that the partial loss of privacy. Also, it should be remembered that at least in some cases it would be possible to postpone the demand for institutionalized care, where the loss of privacy is much more significant.

Automatic systems can always be criticized. In this case the safety alarm system was criticized by officials from the point of view of human care, as it was seen as a cold and impersonal technology. The aim of this technology was not, however to replace human relationships or reduce the amount of care given by home care personnel or family members. The aim of it was to take care of the safety of the person when being alone and reduce the worry and stress of the caring people. (Leikas et al., 1998.)

Of the new technologies, mobile devices in general and mobile phones in particular, are facing the challenge of ensuring the privacy and security of the users, the two aspects that are often in conflict with another. For example, emerging mobile payment and ticketing solutions require secure transmission and storage of financial information, while electronic health records and access certificates can include highly sensitive personal information in these devices. Securing interaction when using mobile devices is challenging, as typically there are no shared information such as passwords, addresses, or PIN codes between the phone, the user and the service to be used.

In addition to trust and privacy, *user control* is an essential factor when designing technology. The user should be able to trust that the system or device functions as it should and remains in a full operational order. When consciously adopting technology, the person should also be able to trust that (s)he can decide whether to operate the system or device or not and, for example, turn the system off whenever (s)he desires to do so.

These issues may, however, produce new problems along with the adoption of new technologies. When a service is developed, for example, to support activities in daily living with the help of new technologies, such as ubiquitous technology and ambient intelligence, the technology in a way operates in the background unnoticed and reacts to a person's activity only according to the preset premises. In case of older adults, services like these may bring substantial en-

hancements in the quality of and coping in life. In these applications, however, the user control diminishes and the person cannot be aware of the functionality of the technology all the time. It is also important to notice that the usage of these kinds of sensing technologies developed may lead to a decrease in human contacts and human interaction. This in turn may lead to a decrease in the person's own control of the technology.

Older people themselves face often trade-offs when making decisions about adopting technology. They might accept a technology with significant privacy implications given its overall value for sustaining a more independent lifestyle, and then again, they might reject a simple technological aid owing to concerns of overreliance on technology (Mynatt et al., 2004). Thus, in order to connect the good of man and technology one must be able to figure out what actually might constitute the good of man. This can be examined through the concept of good life. What is a good life where a human being can express oneself in order to accomplish valuable goals? The ethical questions related to technology should thus not be examined only in the light of negations, such as loosing privacy or autonomy, but consideration should be given to how technology can help in enhancing the degree of our autonomy and independent living, and, in general, how it can facilitate good life.

In addition, it is good to remember that there is always a group of people who, e.g., because of ideological reasons, want to be left behind technical development and technical services. These people consciously neglect the acquisition of skills and abilities necessary in the information society. This conscious opting out, as well as the demand for respecting this will, are a sign of cherishing one's privacy (Mäkinen, 2006).

7.9 Ethicality of technology adoption

Older adults are usually quite strict and considerate when purchasing a product or artefact. Important criteria for the purchase are, for example, the general quality and safety of the product. Also, clear and easy-to-read usage instructions are meaningful, although one does not really pay attention to them in the purchase situation. Older adults stay often loyal to certain producers of products. Especially older women feel that if it is difficult to use the products the reason is in their inability, not in the product (Leikas, 2007; Leikas and Saariluoma, 2008a).

Gaining trust between the customer and the salesperson in the purchase situation is important. A problem in these situations is often that the older person is

not able to express precisely her or his needs. (S)he usually trusts the sales person, especially in case of technical matters. In many cases the sales person of technical devices is a generation or two younger than the aged customer, which might create difficulties in understanding each other's experience world. The sales person should be able to look at the situation from the older person's perspective and consider the need of a device from this point of view. Also, (s)he should be able to tell about the product properties in a language that the older person understands. The worst case would be if the older person makes the decision to purchase the product based on the eloquence of the sales person and finally, when at home, finds out that the product does not fit in her or his needs.

An essential part of the purchase situation is to inform the older person about the additional costs that the product would bring to the person. These are, for example, costs related to the usage and updating of the product or system.

In order to gain a feeling of self-efficacy, an older person needs time to digest the information that is delivered. This is why the sales person has to have enough time for the sales event. (S)he has to have time to guide the person how to use the product or system and be sensitive in understanding the needs of the customer in terms of listening to the questions and answering them in an understandable way.

7.10 Taking care of others

Information society is here to stay. New technologies constantly increase their share in everyday human life. Future emerging technologies will keep the development of new society in a full steam, and very soon even more revolutionary possibilities will become everyday household matters. Technology will cause essential changes in our society and our lives. In the early eighties even specialists were not necessarily aware of new mobile technologies. At that time, e.g., Minitel was the big issue. This example shows the speed and unavoidability of technical development. Consequently, the society around us will change whether we like it or not.

However, creating information society is not only a technical issue. It is also very much a human one. Fundamentally this means that the role of information society is to enhance the quality of people's lives and, accordingly, the role of technology to support this goal. People are increasingly conscious in their everyday lives about the fact that they are living in an information society. Unfortunately, this perception is not always a positive one; many citizens face difficulties and

anxiety when trying to adopt the new technologies offered by the society. This is, in most cases, due to the failure in the design, i.e., inability of ICT design to truly consider the everyday life and the goals that people have in it.

Suddenly, we are in a situation where two ways of thinking meet each other inside design processes. On one hand, technical thinking applies technical concepts, i.e., how the laws of nature are applied to reach the technical goals under technical restrictions (Pahl and Beitz, 2007). The main role of the user is to take care of those actions in the systems which cannot be technically realized. Mostly, these actions entail operation level selections and, to some degree, what the technology is used for. Evidently, when working with these types of paradigms, the core user challenge is good usability and not the human side of information society.

The perspective in technology design has been directed in a technically-minded manner. Ultimately the question is about ways of thinking in technology development, i.e. the concepts and ways of operations that we use as a basis for the design. A traditional way of thinking is the technical approach, which aims at creating information society on the terms of technology. Another way of thinking is the Life-Based Design approach presented in this book, which emphasizes the holistic understanding of human life as a foundation for the design.

Life-Based Design brings in a new way of thinking, i.e., new concepts, new questions, new research paradigms and new perspectives in our technology design discourse. The main goal is to replace technical intuitions about future information society with well grounded social, philosophical, psychological and humanistic facts instead of everyday intuitions. Technical thinking cannot go beyond its concepts. It cannot replace social and human research knowledge as these types of questions are beyond technical theory languages.

Life-Based Design is a new advanced way of thinking in technology design and a design approach which combines information society and people's life. Thus, it is a more suitable design approach than the traditional ones, as it brings in a new way to perceive essential questions in the development of information society.

These types of new openings are necessary to help the problem-solving capacity of the designer increase. It is essential to understand that we either are able to foresee and solve the problems of information society, or we have to suffer from poor solutions. It would be naïve to think that random and intuitive analysis of social and human aspects of technical design would not cause us real harm. We do not have an alternative to incorporating human research into technical design

discourse. It has to become an essential part of technology design with all its skills, concepts and knowledge. Otherwise, the risks associated with growing problems become all too big. Therefore, a tacit replacement of real social and human research with loose everyday intuitions is improper and a certain way to difficulties. We must find a good way to take advanced social and human research as a part of modern technical design.

People should be adequately prepared for the technological change in the information society. The change should thus be carried out in terms of people, based on the life world and positive experiences that people have of technology. These experiences are gained from the true value that technology brings in to the lives of people. This means that they can be gained only by focusing on people's lives and the values that people follow in them. If this principle is accepted, the information society will proceed in a meaningful manner.

The aim of sense-making information society is to promote life with human dignity, i.e., life with a human face. Taking care of others is a focal ethical stand in this vision. When committing themselves to this aim designers are faced with a substantial responsibility. Technology will ultimately change the structures of the society and everyday lives of people in a profound way. What kinds of expressions the society will have depends significantly on the design approaches for ICT society design. Life-Based Design is one seriously thinkable approach for meeting the human demands of the information society.

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Title

Life-Based Design
A holistic approach to designing human-technology interaction

Abstract

We need a multidimensional and holistic approach to human-technology interaction (HTI) design in order to understand what technology could really offer for people and in what forms and on what terms it would be welcomed and adopted. To answer this challenge, a new holistic design paradigm Life-Based Design is introduced in this book.

The design of HTI should consider the additional value that technology brings to users. Technology should exist not for itself, but rather for bringing added value to the everyday of people, thus improving the quality of people's life. Therefore the aim of HTI should be to consider the human-technology interaction in a much larger context than within the context of using technology. In addition to physical usage environment, the impact of, for example, psychological and social environments of the users should also be taken into account in the design. This calls for a holistic consideration of the problem at hand, without necessarily getting off the ground with technology first in mind as the primary solution.

As the grounds for the design should be in a richer and more comprehensive appreciation of human-technology interaction, the starting point of the design should be in comprehension of people's lives. This is especially important now as technology development is focusing more and more on developing services besides technologies. Design of service concepts, if any, has to be carried out with a much broader design approach than what the traditional approaches to human-technology design can offer.

Mere investigation of the elements of life is not enough to guarantee successful design outcomes. We need to have well-grounded methods and tools for the design which can utilise our investigations of life and implement this knowledge into the design work. The basic concept in Life-Based Design paradigm is 'form of life'. With this concept it is meant any systems of rule-following actions in people's lives. Forms of life offer a simple but very usable approach to examine life in all kinds of situations. They define what people do by defining their rule-following actions and attributes in a context. With the construction of a description of a form of life it is possible to get an idea about what ICT-designers can do to improve the lives of the people sharing that particular form of life.

Defining components of a form of life is a critical step in the design. It allows designers to understand how people could be supported in their pursuit towards the goals they have in participating in a particular form of life. Following the paradigm introduced, the rule-following actions and design-relevant attributes can be explicated and configured to technology-supported actions (TSAs). Creating the descriptions of TSAs enables designers to define problems accurately and to concentrate on designing solutions for them.

The holistic perspective to ICT design is discussed in this book in a context of older adults and gerontechnology by reviewing the main ideas and findings of the field. This material provides us with a concrete conception of how forms of life can be investigated to direct the development of new technologies.

The aim of Life-Based Design is the use of vital understanding about people's life as the basis of the creation of design ideas and concept design, to guide the whole development process of products and services. It is thus the kind of activity which should be carried out first in the development process. It will produce decisive information for further phases in the development process.

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Tekijä(t)
Jaana Leikas

Nimeke

Elämälähtöinen suunnittelu
Kokonaisvaltainen lähestymistapa ihmisen ja teknologian vuorovaikutussuunnitteluun

Tiivistelmä

Tarvitsemme moniulotteista ja kokonaisvaltaista näkökulmaa ihmisen ja teknologian välisen vuorovaikutuksen kehittämiseen, jotta voimme ymmärtää, mitä teknologia todella voisi tarjota ihmisille sekä missä muodossa ja millä ehdoilla sitä oltaisiin halukkaita käyttämään. Tässä kirjassa esitellään uusi holistinen suunnittelunäkökulma, elämälähtöinen suunnittelu (*Life-Based Design*).

Teknologian tehtävänä on tukea ja parantaa ihmisten elämänlaatua. Hankimme ja käytämme teknologiaa aina tietystä syystä, saavuttaaksemme asettamiamme päämääriä. Teknologian tulisi tukea toimintaamme näiden päämäärien toteutumiseksi. Tämä on mahdollista vain, jos tuotteiden ja palveluiden suunnittelun keskiössä on ihminen eikä itse teknologia. Perinteinen IT-suunnittelu on keskittynyt enemmän tekniseen näkökulmaan kuin teknologian rooliin ihmisten elämässä. Suunnittelunäkemyksen lähtökohtana on useimmiten jo olemassa oleva visio toteutettavasta tuotteesta ja käytettävästä teknologiasta. Perinteinen suunnittelu alkaa siten jo aikeesta kehittää juuri tietty tuote tai sovellus. Se ei kerro, miten tarve juuri tämän tuotteen kehittämiseen on ymmärretty – toisin sanoen miten on voitu varmistua siitä, että suunnittelu tulee ylipäätään tuottamaan käyttäjien elämän kannalta mielekkään, tarpeellisen ja halutun tuotteen.

Jotta teknologia parantaisi elämänlaatuamme, tulee teknologian kehittämisen lähtökohtana olla näkemys ihmisten elämästä. Elämälähtöinen suunnittelu tuo suunnitteluprosessiin nykyisiä menetelmiä holistisemman näkökulman. Se linkittyy perinteiseen käyttäjäkeskeiseen suunnitteluun asettamalla prosessin alkuun elämänmuodon (*form of life*) analyysin. Näin se korostaa suunnittelussa ihmislähtöisyyttä ihmiskeskeisyyden lisäksi. Elämänmuodon analyysi eroaa strategisesti perinteisestä konseptisuunnittelusta siinä, että se ankkuroituu ihmis- ja sosiaalitieteisiin ja tuottaa ihmisten elämänmuotoja koskevaa tieteellistä tietoa ja suunnittelua ohjaavia attribuutteja. Täten se ohjaa strategisesti koko iteratiivista suunnitteluprosessia.

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The measure of technology is in its ability to enhance the quality of life for people. There is always a specific reason for adopting and using technology. This is to reach the goals that people have set for themselves in their everyday life. Technology should support people in carrying out their actions when accomplishing these goals. This means that good ICT design should fit technology in service of practical human life. Consequently, it is necessary, when beginning to design, to analyse what kinds of technologies people need by examining and analysing life itself. To answer this challenge, this book introduces a holistic design paradigm, Life-Based Design (LBD) for human-technology interaction design. The aim of LBD is the use of vital understanding about people's life as the basis of the creation of design ideas and concept design, to guide the whole development process of products and services. It is thus the kind of activity which should be carried out first in the design. It will produce decisive information for further phases in the development process.

The basic concept in this LBD paradigm is 'form of life'. With this concept it is meant any systems of rule-following actions in people's lives. Forms of life offer a simple but very usable approach to examine life in all kinds of situations. They define what people do by defining their rule-following actions and attributes in a context. With the construction of a description of a form of life it is possible to get an idea about what ICT-designers can do to improve the lives of the people sharing that particular form of life. Form of life analysis with the design-relevant attributes is thus directed towards strategic management of the iterative design.

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