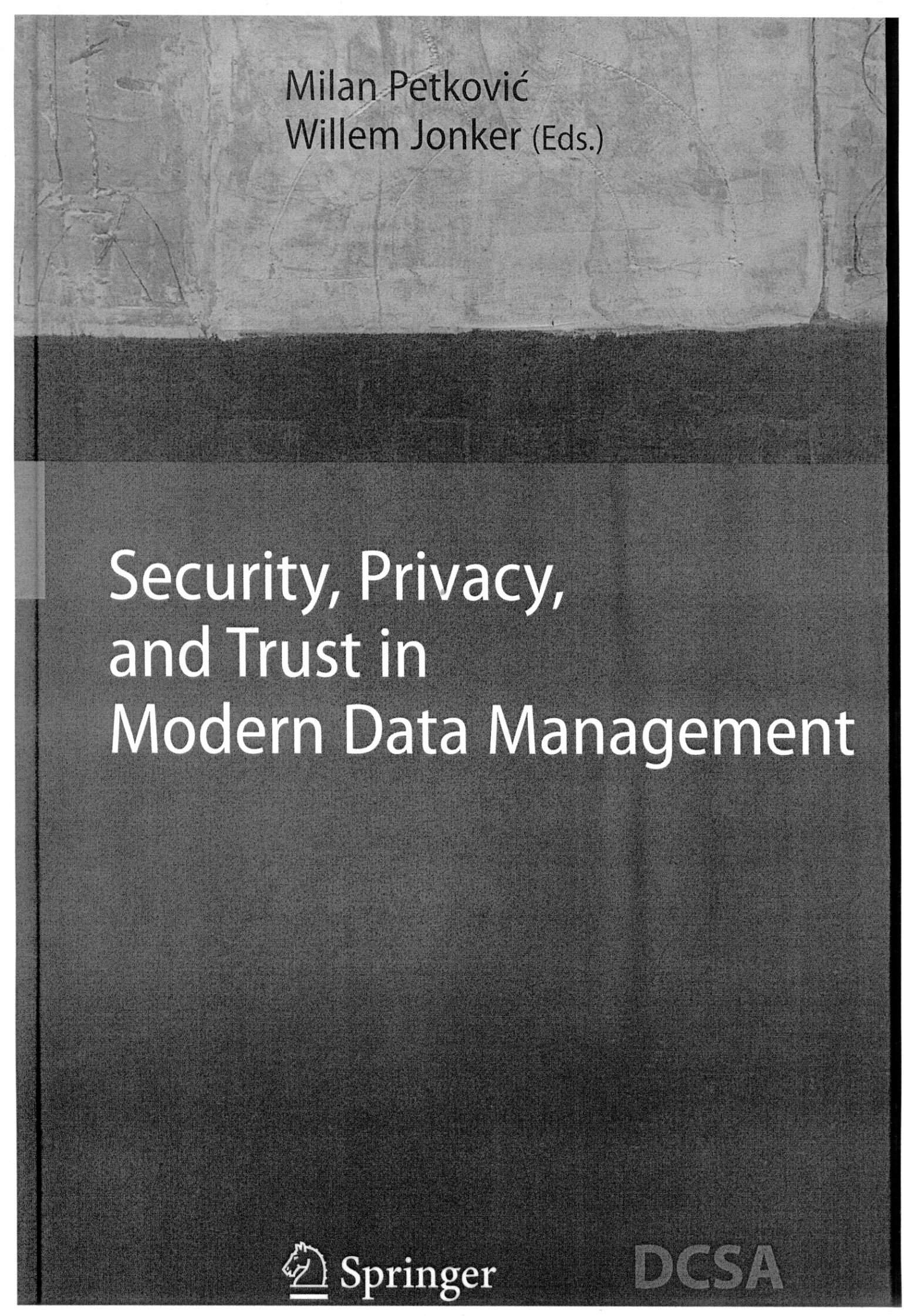
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The Persuasiveness of Ambient Intelligence

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Summary. Ambient intelligence (AmI) is a novel concept for embedded computing that builds on the large-scale integration of electronic devices into peoples' surroundings and the ubiquitous availability of digital information to the users of such environments. The concept however is not only concerned with the integration of computing in the background but, as a direct result of the disappearing computer and the corresponding interaction technologies, it calls for novel means of control that support the natural and intelligent use of such smart environments, emphasizing predominantly social aspects. As the familiar box-like devices are replaced by hidden functions embedded in the surroundings, the classical meaning and implication of security and trust needs to be revisited in the context of ambient intelligence. In this chapter, we briefly revisit the foundations of the AmI vision by addressing the role of AmIware, which refers to the basic and enabling AmI technologies, and by presenting some basic definitions of ambient intelligence. Next we discuss the meaning and role of persuasion on the basis of models and theories for motivation originating from cognitive science. Notions such as *compliance* and *ambient journaling* are used to develop an understanding of the concept of ambient persuasion. We also address the ethics of ambient intelligence from the point of view of a number of critical factors such as trust and faith, crossing boundaries, and changing realities. The chapter concludes with a summary of findings and some final remarks.

24.1. Introduction

Recent technological advances have enabled the miniaturization of embedded hardware thus facilitating the large-scale integration of electronic devices into peoples' backgrounds. In addition, novel interaction concepts have been developed that support the natural and intelligent use of such systems, emphasizing the social aspects of the technology embedding. The resulting computing paradigm, which is called ambient intelligence (AmI), provides users with new means to increase their productivity, increase their well-being, or enhance their expressiveness [1].

In addition to the physical benefits provided by hardware embedding, AmI environments exhibit a number of features that rely on adequate social embedding such as context awareness, personalization, adaptation, and anticipatory behavior. However, as the familiar box-like form factors of devices will disappear to be replaced by pointers to their functional properties embedded in the environment, new interaction concepts will be developed that differ substantially from the traditional box-related user interfaces. The classical concepts and definitions of trust and security will be challenged by the resulting AmI applications, and they need to be readdressed to meet the needs and requirements imposed by the use of hidden technologies. Although many technologies in the area of copyright protection, firewalls, data encryption and digital signatures can increase the security of AmI environments, there is a need to convince the end user to trust such secured AmI environments. This raises the question of persuasiveness in relation to ambient intelligence. To discuss this issue we introduce the concept of ambient persuasion as the extent to which AmI technology supports convincingly natural interaction with smart environments. In this chapter we elaborate on this concept and derive a framework for the discussion of the resulting challenges and issues

The chapter is organized as follows. First we introduce the foundations of the AmI vision based on the notion of AmIware, which refers to the enabling AmI technologies in the areas of processing, storage, displays, and connectivity. Next we briefly review the concept of ambient intelligence and the paradigm shift its realization will introduce with respect to ethical issues in general and trust and security specifically. The body of the chapter is devoted to the concept of persuasiveness in smart environments. We elaborate on issues such as motivation and learning as a theoretical framework for the development of user requirements for persuasiveness in ambient intelligence. The chapter concludes with a summary of findings and recommendations.

24.2. AmIware

It is generally known that the integration density of systems on silicon doubles every 18 months. This regularity, which is known as Moore's law [2], seems to hold a self-fulfilling prophecy because the semiconductor industry has followed it already for more than three decades. Also, other characteristic quantities of information processing systems, such as communication bandwidth, storage capacity, and cost per bit of input-output communication seem to follow similar rules. These developments have given rise to a new kind of miniaturization technology called AmIware, which enables the integration of electronics into peoples' environments. We mention the following examples. The introduction of the blue laser in digital recording made it possible to construct miniaturized consumer devices

that can record tens of hours of video material. Consequently, small personal digital assistants and storage devices can be constructed that support video functionalities. Poly-LED technology made it possible to construct matrix-addressable displays on foils of a few microns thickness, thus enabling the development of flexible ultra-thin displays of arbitrary size. Similar technologies have been used to produce light-emitting foils that can not only replace lighting armatures but also turn any smooth surface into a lighting device. Developments in materials science have enabled the construction of electronic foils that exhibit paper-like properties. These so-called electronic-paper devices introduce a new dimension in the use of electronic books or calendars. Advanced LCD projection technologies allow very large high-definition images to be displayed on white walls from a small invisible built-in unit. Novel semiconductor process technologies make it possible to separate the active silicon area from its substrate, and to put it onto other carriers such as glass, polymer foils and cloth, thus enabling the integration of active circuitry into tangible objects and clothing. Advanced LED technologies enable the integration of light-emitting structures into fabric. The resulting photonic textiles can be used in carpets, drapes, furniture, and clothes. Advances in digital signal processing have made it possible to apply audio and video watermarks that enable conditional access, retrieval, and copy protection of audio and video material. Compression schemes such as MPEG4 and MPEG7 enable the effective transmission and composition of video material. Recent developments in speech processing and vision introduce interaction technology for the development of conversational user interfaces, which are a first step towards the development of natural interfaces. These are just a few examples. For a more detailed treatment we refer to [3].

AmIware makes it feasible to integrate electronics into any conceivable physical object, i.e., into clothes, furniture, carpets, walls, floors, ceilings, buildings, objects, etc. This opens up new opportunities for electronic devices, because it implies that we can close the age of the box and enter a new age in which functionalities such as audio, video, communication, and gaming, which were confined to boxes up to now, may become freely available from the environment, supporting people to have free access to their functionality and enabling natural interaction with them.

24.3. Ambient Intelligence

Ambient intelligence aims to take the integration onset of embedded devices one step further by realizing environments that are sensitive and responsive to the presence of people [4]. The focus of ambient intelligence is on the user and his experience from a consumer electronics perspective, which introduces several new basic problems related to natural user interaction and context-aware architectures supporting human-centered infor-

mation, communication, service, and entertainment. For a detailed treatment of ambient intelligence we refer the reader to Aarts and Marzano [5] who cover in their book many different related aspects ranging from materials science to business models and issues in interaction design.

24.3.1. A Definition of Ambient Intelligence

In their book, Aarts and Marzano [5] formulate the following five key elements of ambient intelligence:

1. *Embedded*: many networked devices that are integrated into the environment
2. *Contextaware*: that can recognize persons and their situational context
3. *Personalized*: that can be tailored towards their needs
4. *Adaptive*: that can change in response to actions, and
5. *Anticipatory*: that anticipate peoples' desires without conscious mediation.

As already mentioned, ambient intelligence is a new paradigm that is based on the belief that future electronic devices will disappear into the background of people's environment, thus introducing the challenging need to enhance user environments with virtual devices that support natural interaction of the user with the integrated electronics. The new paradigm is aimed at improving the quality of life of people by creating the desired atmosphere and functionality via intelligent, personalized, interconnected systems and services. The notion *ambient* in ambient intelligence refers to the environment and reflects the need for typical requirements such as distribution, ubiquity, and transparency. Here, distribution refers to non-central systems control and computation; Ubiquity means that the embedding is overly present, and transparency indicates that the surrounding systems are invisible and non-obtrusive. The notion *intelligence* in ambient intelligence reflects that the digital surroundings exhibit specific forms of social interaction, i.e., the environments should be able to recognize the people that live in it, adapt themselves to them, learn from their behavior, and possibly show emotion. In an AmI world people will be surrounded by electronic systems that consist of networked intelligent devices that are integrated into their surrounding and that provide them with information, communication, services, and entertainment wherever they are and whenever they want. Furthermore, the devices will adapt and even anticipate peoples' needs. AmI environments will present themselves in a very different way than our contemporary handheld or stationary electronic boxes, as they will merge in a natural way into the environment surrounding us, hence allowing for more-natural and human interaction styles.

24.3.2. What is New?

The major new thing in ambient intelligence is the involvement of the user. Most of the earlier computing paradigms such as personal, mobile, and ubiquitous computing were aimed in the first place at facilitating and improving productivity in business environments, but it goes without saying that these developments have played a major role in the development of ambient intelligence. The next step, however, is to bring connectivity, interaction, interoperability, and personalization to people and into people's homes. This is not simply a matter of introducing productivity concepts to consumer environments. It is far more than that, because a totally new interaction paradigm is needed to make ambient intelligence work. Contemporary concepts of productivity are to a large extent still based on the graphical user interface known as the *desktop metaphor* that was developed by Tesler [6] in the 1970s, and which has become a world standard in the mean time. What we need is a new metaphor with the same impact as the desktop metaphor but which enables natural and social interaction within AmI environments, and this is a tremendous challenge. Philips' HomeLab [7] is an example of an experience prototyping environment in which this challenge is addressed. It is a laboratory consisting of a house with a living room, a kitchen, a hall, a den, two bedrooms, and a bathroom that supports rapid prototyping with integrated speech control, wireless audio-video streaming, and context-awareness technology. It enables the realization of new applications within short development times. HomeLab is also equipped with sophisticated observation systems that allows behavioral scientists to observe users in an unobtrusive way for possibly long periods of times. In this way it has been shown that it is possible to investigate the true merits of novel AmI applications through extensive user studies [8]. Over the years it has become obvious from the studies conducted in HomeLab that the impact of novel AmIware is not determined by its functionality only but also to a large extent by its persuasiveness. Therefore, we have started to investigate this issue in more detail and below we report on some of our findings.

24.4. Persuasion

In their discussion on security in AmI environment, Verbauwhede et al. [9] argue that traditional solutions for providing security will fail in AmI environments since these techniques traditionally focus on the communication channel and assume that the environments connected by this channel is secure. Similarly, for trust there needs to be more emphasis on the environment than on the communication channel. Since it is fundamentally different to create trust in an environment than in a communication channel, there is a need to involve different strategies for creating end-user trust in

AmI environments. These strategies bring forward a paradigm shift in user–system interaction concepts characterized by the following two changes:

1. The role of applications and services will change from traditional access and control means towards lifestyle assistants.
2. The emphasis on perceived user value will change from usability towards creating user experiences such as presence, connectness, and immersion.

This paradigm shift in user-system interaction implies that it becomes increasingly important to obtain insight into the human factors that influence human behavior. When considering behavioral change, three concepts appear: *persuasion*, *motivation,* and *learning*; see Fig. 24.1.

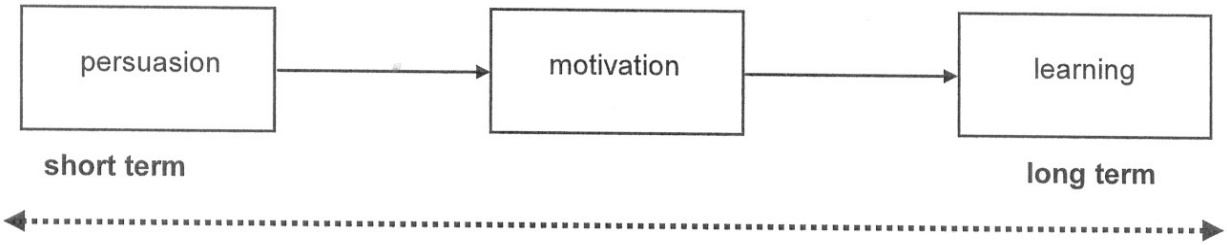

Fig. 24.1. The relation between persuasion, motivation and learning.

Persuasion is an attempt to change attitudes and/or the behavior of persons without using force or deception. A *motive* is a need or desire that causes a person to act. Learning is the modification of a behavioral tendency by experience that is not simply attributed to the process of growth. While persuasion reflects a momentary effect, learning implies a more long-term change of behavior.

How human behavior is driven or motivated and how it can be modified has been one of the most important research topics in psychology for many decades. In fact, motivation as a cause for behavior plays an important role in learning. Although motivation does not always imply learning, learning relies on motivation to happen. Learning is defined as the modification of a behavioral tendency by experience that is not simply attributed to the process of growth.

24.4.1. Models and Theories of Persuasion

Influencing people to change their behavior is not a new area of research. In fact, human sciences have been investigating for a long time how an individual's behavior can be changed by external factors. Whereas sociology studies the human as a member of a social structure, psychology studies the human as an individual. From a sociological point of view, Durkheim [10] has argued that an individual's behavior is determined by the societal structures of which this individual is a part. In psychology much attention has been attributed to processes of learning and behavioral change. Theo-

ries on learning and human motivation have put forward numerous models for influencing and changing human behavior.

Several theories on human motivation have been developed that approach the issue from the human as an individual. Below we mention a few important ones.

- **Behavioral approaches** position behavioral change as a consequence of conditioning. Pavlov [11] founded one of the first models of motivation. With his theory of classical conditioning, an unconditioned stimulus that has an unconditioned response, is associated with a conditioned stimulus. A more sophisticated approach to behavioral changes is the operant conditioning approach. Thorndike [12] was the first to use the concept of instrumental learning. Following this early work many studies used the mechanism of associating certain responses with stimuli. Later, Skinner [13] described operant conditioning as an approach for learning voluntary responses. By (i) using positive and negative reinforcement, (ii) varying the amount of time between stimulus and response, and (iii) varying between a fixed and variable ratio for giving a reinforcer, different learning effects are obtained.
- **Cognitive approaches** rely on reasoning to explain behavioral changes. The drive for changing behavior is found in the effect of knowledge (presence or absence) and reasoning upon this knowledge. The cognitive dissonance theory states that the realization of a person that there is a discrepancy between present knowledge serves as a drive for behavior to remove or reduce this disequilibrium [14]. Variants of the cognitive approaches are found in the attribution and expectancy theory. The attribution theory states that a person tries to attribute success and failure to themself or others. Additional, the person can have control or not over these attributions.
- **Expectancy theory** views motivation as the product of perceived probability of success (expectancy), connection of success, and reward (instrumentality) in relation to the value of obtaining the goal (valance). All three aspects must have a high score in order to achieve motivation. The expectancy theory of motivation was first introduced by Vroom [15] and has been applied since to many empirical studies that were aimed at revealing the mechanisms underlying certain specific deferring human behavior such as alcoholism and violence.
- **Dual process models** explain behavioral change by means of a combination of both reflective (i.e., more rational or cognitive) and impulsive (i.e., more emotional or reactive) mechanisms [16]. The underlying hypotheses for these models can be formulated as follows.
  - Behavior is the effect of two distinct systems of information processing: a reflective and an impulsive system
  - Both systems work in parallel but the impulsive system is always used

  - The reflective system requires more cognitive capacity than the impulsive system. As a consequence the reflective system is easier to disturb.
  - The elements of information used in the reflective system are related through semantic relations while the elements in the impulsive system are related on the basis of contiguity and similarity
- **Captology** refers to a series of principles for technological solutions to influence human behavior [17]. In captology the human is studied as interacting with technology. More specific, this research area has investigated how technology can persuade people to change their behavior and attitudes. Persuasion is defined as an attempt to change attitudes or behaviors (or both) without using force or deception [17]. This persuasion should be intended by the designer of a system and is built into a product or service. Following the theory of captology, technology can be persuasive due to the following actions.
  - Making things easier, reducing complexity
  - Guiding users through a step-by-step process
  - Personalizing to the user and context
  - Suggesting things to the user at the right time
  - Monitoring the user so that the user can learn from himself
  - Monitoring others so that the user can learn from others
  - Conditioning the user

In the next section, we combine the concept of ambient intelligence and the notion of behavioral change into an approach we call ambient persuasion.

24.5. Ambient Persuasion

We use the term ambient persuasion to refer to the use of AmIware in a context-aware and networked infrastructure to enable context-sensitive system behavior and deliver persuasive content that is tailored to the user at the right time and at the right place. Potentially, ambient persuasion combines all the key elements of ambient intelligence, presented in the previous sections, in order to apply persuasive strategies. Fogg [17] has identified the following persuasive strategies as relevant.

1. *Reduction* replaces a complex task by a simpler one by virtue of the introduction of automation and computation, but also by virtue of anticipation of a defining characteristic of ambient intelligence.
2. *Customization and tailoring* adjusts messages and content to the beliefs and needs of the person. Personalization is an essential aspect of ambient intelligence; in this case it covers not the superficial aspects of the

system behavior but addressing the specific needs, problem and situation of the individual. This requires very rich, privacy-sensitive models of users that go beyond simple habits and preferences, and include aspects of their personality, their health status, the social network and context, etc. It requires embedding ambient intelligence in the social context of a person, a notion that extends the definition of ambient intelligence to cover also aspects of social intelligence [18].

3. *Suggestion* reminds people to perform certain behaviors at opportune moments. Prompting of behaviors then needs to be sensitive to context, a central aspect of ambient intelligence.
4. *Self-monitoring* allows people to monitor themselves and to inform themselves about how they could modify their behaviors. Self-monitoring can be very tedious; it will be argued below that ambient intelligence opens up the opportunity to facilitate this process and thus achieve persuasion.

24.5.1. Compliance

A particularly promising domain for studying persuasion concerns health care and especially how people can be motivated to adopt healthier lifestyles. In the domain of medicine the general problem of persuasion has been called compliance. Winnick [19] defines *compliance* as *the extent to which a person's behavior coincides with medical or health advice*. Compliance is recognized as a major challenge in medical research, especially when treatment protocols are individualized or situation-dependent or where the patient is unsupervised and so reporting on compliance is not reliable [20]. AmI technology offers new possibilities supporting the monitoring of compliance behaviors and triggering persuasive interventions.

To give the reader some idea regarding the intricacies of achieving compliance, we shall examine the case of asthma treatment in pediatrics. Asthma treatment attracted the interest of captologists early on and remains a challenge for medical research after decades of relevant research. There are some persuasive technologies that have been designed for asthmatic children, though they have not always been described under this label. We mention two examples. *Quest for the code* is an educational video game for adolescents; the game simulates social encounters with pop idols for teenagers. Children are presented with facts about asthma and are quizzed about it. *Bronkie the bronchiasaurus*, is a Nintendo-based system in which players (children aged 7-12) help a cartoon character manage its asthma [21]. Lieberman reports a longitudinal study that showed that children could cope better with their asthma as a result of playing with Bronkie.

These two examples are software applications for game platforms or PCs, that achieve persuasion through drilling behaviors and knowledge while playing a computer game. An alternative approach that has more

potential for embedding in the targeted context is to embed persuasion in interactive artifacts. A recent example for the case of asthmatic children is the *Funhaler* a novel asthma spacer device for pre-school children where inhalation produces whistling sounds and moves a toy fitted in the device. It looks very much like a standard inhaler into which a transparent compartment is inserted containing a toy and producing the sounds when the child inhales. An evaluation relying on reports by the parents claimed that the Funhaler achieved a 38% improvement in compliance [22].

The Funhaler relies on fun as an extrinsic motivator for compliance. The enjoyment of the sound and movement is unrelated to the illness or the treatment and provides a short-lived reward that loses its value after a few repetitions. In general, it is known that motivating user behavior using only external rewards will not have lasting effects on behavioral change, with compliance gradually declining when the external motivation is removed [23]. We can expect that the lasting effects of the Funhaler will be limited. It seems like a promising solution to solve the problem of children refusing to use an inhaler device. In order to achieve persistent effects regarding compliance there should be more effort paid to educating children through technology and providing them with persuasive advice regarding their asthma treatment at appropriate moments and places.

A major research challenge for the medical field is the need for better data on compliance, e.g., in some cases mothers report 60% compliance where pharmacy records show only 12% (see [19]). There are numerous research results pointing in the same direction. Self-report on compliance or, more generally, obtaining compliance data through surveys is not reliable. The need to monitor and facilitate self-monitoring emerges as a very useful and attainable target for the health care technologies of tomorrow.

24.5.2. Ambient Journaling

Returning for a moment to the strategies of persuasion mentioned above, we saw the need to facilitate self-monitoring. We need to get away from relying on memory or paper/journals regarding compliance to a regime and to move towards systems and services that will serve this purpose reliably. In the domain of healthcare it is clear that the technological challenges lying ahead to support compliance are exactly those needed to support the development of persuasive technologies. We shall call these technologies *ambient journaling.* They require the combination of observable data regarding the behavior studied with self-report data, obtained by the user either through direct prompting at the moment or by retrospective prompting shortly after the event.

In the medical field, a specialized survey method that is quite well established for studying compliance, also used in the survey of mothers mentioned above, is the *24-hour behavioral recall interview,* where the interviewer inquires into compliance behaviors over the last 24 hours. This

method is limited by the reliability of self-reporting in retrospective interviews and cannot capture compliance data accurately, e.g., in the case of asthma the time separating an inhalation and an asthmatic crisis, the frequency of the inhalations, etc.

The need to develop technology and methodology to support user research in the field is a current issue in psychology and human–computer interaction research. Kahneman et al. [24], for example, have proposed the day reconstruction method, a direct analogue to the 24-hour behavioral recall interview, which is aimed at characterizing daily life experiences in terms of affective state over the day. Methodological studies have examined how audio and photographic capture impacts diary studies (see [25]), but diary methods are still prone to recollection and compliance problems when the initiative for recording all data is left to the informant. In order to study daily-life activities a sensor-based variant of experience sampling has been proposed, called the event sampling method [26]. According to Larson and Csikszentmihalyi [27] experience sampling involves prompting users to self-report at random, or at scheduled moments in the day, thereby forcing through the protocol the timing of the inquiry. In cases where a very specific type of activity of short duration may happen at different moments in time, such as taking prescribed medication, experience sampling can be very inefficient. It is preferable that reporting is tied to relevant events rather than be randomly/arbitrarily invoked upon the informant.

The challenges for the future are clear: ambient journaling is an essential constituent for ambient persuasion but will also itself be the most appropriate tool for assessing its success. It calls for developments in technology that will allow problem-specific detection of events and situations, and that will prompt context-specific requests from users.

Reflecting on our definition of ambient journaling as our research target, we have come full circle to the defining characteristics of ambient intelligence. Where some of the earliest visions of ambient intelligence shared the idea of creating some model of the context and of user activities in order to automate some daily chores or facilitate information access, we have demonstrated the need to create technological infrastructure and to design appliances to support users to create their own model themselves. This should not surprise the reader. As ambient intelligence puts the user as a human and as an individual person in a pivotal position, it should not surprise us that, when we move towards delivering applications where the stakes are high (health, well-being), then the central issue is to let the user easily and reliably construct and maintain the model of themselves, their activities and context. Predictably, the need to control what information is captured about oneself, and its disclosure and usage emerge as necessary user needs to protect the privacy of individuals in this emerging technological landscape.

24.6. The Ethics of Ambient Intelligence

The opportunities of ambient persuasion also comes with threats. Can AmI environments become persuasive in such a way that people put faith and trust into them? Do people want to cross the boundaries of their private and safe worlds, and can they change seamlessly between real and virtual worlds? Below we treat some of these issues in more detail.

24.6.1. Trust and Faith

One of the central questions in the social acceptance of ambient intelligence is whether people will be able to adapt to the feeling that their environments are monitoring their every move, waiting for the right moment to take care of them. Much of this acceptance will depend on the functional benefit of such environments and on their ability to interact with people in a natural way. People also frequently express concerns about the lack of safety and security in such systems because they could be extremely vulnerable to intrusion and damage caused by outsiders. The fact that large amounts of possibly personal information could be freely floating around without appropriate protection is threatening. Also the concern that an environment in which electronics makes autonomous decisions on a large scale could get out of control needs to be taken seriously.

Of a different scale are the concerns that are raised by the fact that personalization requires registration and recording of user behavior. The explicit knowledge about a so-called digital soul of human beings requires the development of different standards for social behavior, and it might even be desired to protect people against their own attitude. Finally, people raise their concerns against the absolutistic technological nature of ambient intelligence. Pushing ambient intelligence to the extreme might lead to a world full of digital surrogates for about everything that is conceivable. Ten years ago Rheingold [28] already listed several threats that may result from the omnipresence of technology, giving rise to virtual worlds, and most of them still hold true after more than a decade of discussion.

24.6.2. Crossing the Boundary

Another issue we will need to consider at some point will be the desirability of ambient intelligence being incorporated into an even more intimate ambience – our own bodies. We are already incorporating intelligence into our clothing, and we are quite happy to have a pacemaker built into our bodies. Warwick took things a step further by having a chip implanted into his wrist linked to the median nerve, which operates the muscles of the hand. It was part of a larger project called Cyborg [29], partly funded by spinal injury organizations. Evidently, this has a medical justification.

But how long will it be before we accept the implantation of chips for nonmedical reasons? Attitudes towards the body are already changing. Body piercing, tattoos and cosmetic surgery are much more common than a generation ago. More recently, the company Applied Digital Solutions received the go-ahead from the food and drug administration (FDA) to market a chip that can be injected into children or Alzheimer's patients, so that they can be traced by GPS. If this sort of product finds widespread public acceptance, will we have crossed an important boundary? Where will people draw the line between the organic and the inorganic, the real and the artificial? And how will that affect how we view and treat our AmI environments, and each other?

24.6.3. Different Realities

A less obvious, but equally fundamental issue that awaits us is an ontological one – about the nature of existence itself, or at least how we perceive it. McLuhan [30] argued that the medium was the message – that we were becoming more interested in television, for instance, than reality. Baudrillard [31] thinks this is only the beginning. He argues that the traditional relationship between media and reality is being reversed. Increasingly, the media is no longer seen as just reflecting or representing reality. They constitute a new, hyper-reality that's felt to be even more real than real reality. The fact that we call semi-staged programs like *Big Brother* reality TV probably says more about what people think of as real than we suspect.

Will we get so used to interacting with our ambient intelligence that it will affect the way we interact with real people? If we come to experience more of the real world through technology rather than directly through our senses, are these indirect experiences less valid? Is hyper-reality less valid than physical reality? Where can we draw the boundary between physical reality and imagination? We may not want to get into deep philosophical discussions like this, but at some point and in some form, these are issues we will need to confront.

24.7 Conclusion

Ambient intelligence should be viewed as a new paradigm for consumer and professional electronics that can claim to be a revolution in the design, appearance, and use of electronics in ordinary life. It may support and facilitate simple and recurrent tasks, but it may also lead to a culture very much different from today's, resulting from the expansion of the use of media into a world in which physical and virtual experiences are merged, supporting personal expression, business productivity, and lifestyles of peo-

ple. Specifically the concept of ambient persuasion offers great opportunities for AmIware to influence human behavior in AmI environments.

It goes without saying that we have great expectations for ambient intelligence. Technology, however, will not be the limiting factor in its realization: trust and faith in AmI environments are most important for end-user acceptance. In this chapter a number of concerns that should be taken into account when developing AmI environments have been discussed.

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