Johanna Maksimainen

Aspects of Values in Human-Technology Interaction Design

A Content-Based View to Values

Hmmm? You know I had a speech, you know, my... my integrated-projected-global-tele-network system bloody system-system. But you know, if that's what the worlds coming to I don't want to be in it. No I don't want that. I don't want to be in some sort of cyber-space-hypervirtual bloody reality. I don't want that- exchanging e-mails with some old age bloody hippies with more information at their fingertips than is safe to know about. I don't want that! What kind of reality is that, huh, you know, with a thirteen-amp plug on the end of it? Huh? Huh?... That can be un-plugged like that?

Jennifer Saunders as Eddie /Absolutely Fabulous

ABSTRACT

In this dissertation, values in human-technology interaction (HTI) are discussed within a content-based framework. In this approach, human thinking in different contexts is set at the focal point. Attention is devoted to those cognitive processes through which mental representations are constructed as well as to the information contents of mental representations. In content-based reference frame mental contents are in decisive role for understanding human behaviour. To explain the differences in HTI design in the behavioural patterns of professionals and their respective mental representations, together with an examination of values, which are traditionally studied through multidisciplinary methods - typically conceived as a type of knowledge that guides the principles of actions and perceptions - is extended in this study to mental contents. Herein the content-based perspective of designers' values is presented as linked to ethics. By applying content-based analysis to an examination of conceptual contents and through interpreting those processes of values, it is possible to reach a deeper view of the cognitive mechanisms which lie as the motivational foundation of human behaviours, such as professional practices.

In the field of information and communication technologies (ICTs), specifically HTI design, this study intends to explore the role of values; their formulation and functioning. This study stresses the importance of internalized values among HTI designers and other actors in the ICT field when ensuring systems such as eLearning applications that would empower their users through their subjective choices. The content-based approach is applied not only to participants in the field of HTI design, but also to various sorts of texts, such as to declarations and IT policies. The scope of values within technology depends to a large extent on how technology is conceptualized. The last few decades has witnessed a variety of interpretations of technology that move beyond the conceptualization of technology as a neutral tool or a historical necessity. This study introduces the conceptualization of technology as primarily a sociocultural, professional and cognitive activity. The examples herein are presented through selected articles. The results provide a more comprehensive understanding of specific values at play within HTI design practices.

Keywords: content-based approach, design thinking, HTI, ICT-ethics, Information Society, mental contents, mental representations, values

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1   INTRODUCTION—VALUES IN TECHNOLOGY

Modern technology and communication devices have initiated the development of the Information Society. Technology has become a central part of everyday life. While technological development continues, there is a risk that awareness of its consequences is becoming less distinct. After all, the primary function of technology is to help people with practical issues. Technology, particularly information and communication technology (ICTs), has manifold effects on peoples' well-being. Therefore, it is important to recognise its effects on individuals, society, and culture. The particular nature of technology, compared to earlier technological revolutions, emerges in changes to how people act naturally. Such technologies enable the creation of realities that are alternative to the 'natural' reality, but just as complex. Specifically, the current direction of technological development seems to satisfy the needs of citizens in the working lives. Will the aging segment be excluded? What will happen with groups that have chosen not to use particular technologies? In addition to users' points of view, value issues related to technology are connected to broad economical and societal questions. What possibilities exist for developing countries to take part in this development? Among the perceived challenges and current development, ethical questions have become more obviously part of critical discussions concerning information system development and the consequences of technological development.

The significance of values becomes visible every day in individuals' choices. Values are present in all aspects of constructing life. Technological development, products, and service design are increasingly prominent parts of such construction. This phenomenon emphasises the importance of investigating values' role in HTI design. The cultural environment reflects changes in the societal paradigm that have been enhanced by societal changes and increasingly have influenced ethical trends in business, since people are obligated to take a stance, correspond, and adapt to new circumstances. Within this continuous state of evolution, the relevance of values is highlighted (e.g., Puohiniemi, 2003; Bowen, 2009). Exploring HTI design professionals' values is crucial because the development of many services or devices starts from an analysis of the world

and a desire to change something in it. This might, for example, be a desire to reduce crime and increase social control in the basic analysis of law enforcement services. Altogether, technologies are implicated in ongoing changes in the world. With this recognition of ICT-related social, economical, environmental, and cultural challenges, actors in the technology industry must consider seriously their organizations' value-objectives, as well as the values that direct design decisions.

The idea of the influences of a designer's personal values on decision-making in design processes is not new. Literature regarding the issue can be found from the 1970s (Rokeach, 1973; Gregory & Commander, 1979) to more recent publications (e.g., Dorst, 2003). It is clear that values influence design in several ways. For example, values direct actions and influence ideas, their relevance, consequences, and so on. Values drive all types of decisions, from the manufacturing of the product to the decisions that designers make at a personal level. Understanding values in such practices benefits professional designers by increasing their awareness of what shapes the decisions they make, allowing them to apply more informed and effective strategies to their actions. However, the technology industry directs and affects societal and cultural development. In the current information society, new ways of being are constructed, which is important to take into account in product and service design. This requires awareness of values, because otherwise, development remains blind.

Value theories cover and encompass diverse approaches to understanding how, why, and to what degree people value, or should value, ideas, objects, or anything else. Here, the primary interest concerning the conceptual construction of values is how values function in the context of HTI design; what is the values meaning for an individual designer, and through which processes values explain the professional's decision-making in design processes. The main argument is that different concepts of values explain different actions. Therefore, the examination is twofold: on the other hand, values are discussed through the field-specific problematic in HTI design, and on the other hand, the wider objective of this study is to outline a content-based reference frame for examining values for future research.

1.1   Approach and Scope of the Thesis

In the construction of psychological analysis for explaining any human action, a number of challenges must be confronted. One is defining explanatory concepts that can cover different aspects of individuals' underlying mental processes (Saariluoma, 1997, 2004). It is not evident that empirical observations automatically explain human behaviour. In such a case, the theory-laden character of observations would be missed (Sellars, 1956/1997). Researchers' own conceptual systems limit their attention to particular aspects of the object under examination. These theoretical positions may easily guide researchers, for example, in the selection of a theoretical and methodological approach or in identifying the

objects of analysis, as well as in deriving conclusions based on the data. In the history of science, the effects of scientific paradigms show the significance of the theory-laden character of scientific observations (Kuhn, 1962/1970).

According to Kuhn (1962/1970), the term 'scientific paradigm' refers to a set of practices within a scientific association that define a particular scientific discipline during a particular period of time, directing what is scrutinized, supposed research questions, and how such questions are formulated, and probing for answers about the research object and how results should be interpreted (Kuhn, 1962/1970). Within a paradigm, accumulating details follow the frames of established theoretical framework, while the focus is not in testing or questioning its underlying assumptions. The prerequisite for scientific progress seems to be the exploration of alternative perspectives to phenomenon under the scientific object of interest (Kuhn, 1962/1970; Saariluoma, 1997). For example, in analysing human behaviour in different contexts, one must reach all the relevant aspects of human mentality and ability to define the types of phenomenon that can be explained through selected scientific paradigm. However, according to Sellars, (1956/1997, 1963/1991) viewing the observation language/theoretical language distinction is merely methodological and highly malleable. Meanings have functional roles in language usage, and nothing in principle prevents a term that might originally have arisen as part of a theory from acquiring a role in observation reports. Furthermore, what is observable depends on the techniques and instruments used, and these are often loaded with theoretical baggage. Obtaining pure observation uncontaminated by theory is, at best, challenging. A good theory does not just explain the observation-level empirical generalizations—it also explains why those empirical generalizations are as good—and as wrong—as they are. In Sellars's view, it is the observation-level empirical generalizations that are ultimately dispensable in favor of the better explanation made available by the theory (Sellars, 1956/1997, 1963/1991). Thus, to have good reason to accept a theory is to have good reason to believe in the existence of those entities it postulates, which is the basic reasoning behind Sellars's scientific realism.

Value research covers a wide spectrum of analyses executed within a variety of disciplines related to the study of human values. From classical Greece to contemporary social science, the integrative conviction within this research tradition is based on the recognition that *values matter*. The diversity of approaches also emerges within the research tradition of organizational researchers and the studies of work values. Despite the use of the term in a variety of literature, very little consensus exists concerning of what constitutes a value (e.g., Kluckhohn, 1951/1954; Rokeach, 1968, 1973; Payne, 1980; Kilmann, 1981; Wiener, 1988; Borg, 1990). Values have been attached to beliefs (Rokeach, 1968, 1973), needs (Super, 1973), criteria for choosing goals (Locke, 1976), goals (Schwartz & Bilsky, 1987), and attitudes (Eagly & Chaiken, 1993). Despite the unquestionable success of value theories and studies in revealing the functions, meanings, and construction of human values, relevant problems may be related to the conceptual construction and interpretation processes of such values,

which do not open in a natural manner to the traditional value theory languages. Therefore, in this dissertation, the content-based reference frame is suggested as an alternative approach to the examination of values, and as a complementary paradigm to contribute to structuring a more solid conceptual foundation for value research. The content-based approach (Saariluoma, 1990, 1995, 1997, 2001, 2002, 2003a) was developed for investigating human thinking. The emphasis is on the mentality of experiencing and explaining human behaviour in terms of information content of mental representations and processes involved in constructing these representations. Thus, in content-based research, the information contents of mental representations form the explanatory basis for exploration.

In this dissertation, the focus is on the concept of *value*, which is discussed in terms of mental representation, and in the empirical part of the study, in relationship to theoretical assumptions of Schwartz's (1992) conception of values. Since his (1992) circular model of values was published in *Advances in Experimental Social Psychology* nearly 20 years ago, the understanding of the values and their functioning has significantly grown. Studies of diverse processes related to values have indicated that the model actually reflects accurately peoples' mental representations of values. The model predicts patterns in the accessibility of values from memory, the effects of value priming on behaviour, feelings of ambivalence toward others, and patterns of value changes. Together, these kinds of findings indicate that mental representations of values include an aspect wherein values are interconnected via the motivational objectives that values denote. Processing of a specific focal value is related to other values operating in the background. However, there are differences in mental representations between individuals. Mental representations are constructed on the basis of different types of stimulus, but also by previous personal conceptual knowledge (e.g., Saariluoma, 2002). When the objective is to understand conceptual structures and the interpretation process of values, the contents of mental representations must be analysed by paying the attention to different types of conceptual content.

Evidently, people differ greatly in their values, and these differences can be parsed only by expanding analysis to examine how conceptual contents of mental representations sustain the importance of particular values. This requires examining the information that is processed in peoples' minds when they indicate that certain values are important to them. Affective, behavioural, and cognitive information may all advance to determine the importance of values in mental representations. For understanding the effects of values on behaviour, we must consider how people shift from the abstract representation of a value to specific behaviours.

1.2 Research Questions

This dissertation discusses the aspects of values, focusing to the context of HTI design and the construction and interpretation process of values at a more general level through content-based reference frame (Saariluoma, 1990, 1995, 1997, 2001, 2002, 2003a). Different aspects of values are explored based on examples presented in the included articles. The research at hand examines the structure of values, and how values function in real-life situations through their different aspects, whether philosophical, practical, human, or socio-cultural. Previous categorizations were naturally simplified, and there is only one possible manner to approach the issue by representing only those aspects that are discussed in the articles. In addition to values as conceptual structures, they are also discussed in terms of ethics.

In this summary, discussion is expanded to consider the construction of human values more generally. A content-based view on values is introduced to the multidisciplinary field of value research to provide alternative and more solid conceptual grounds to investigate the relevant types of mental processes that constitute the conceptual contents of mental representations of values. Consequently, the broad objective and main research question is to examine whether a content-based view on values could be a complementary theoretical reference frame for describing and measuring the cognitive mechanisms of construction of values on more detailed level.

1.3 Structure of the Thesis

After the introduction of the research, chapter 2 will present a content-based reference frame for examination of values. Within the approach, values are conceptualized as mental representations constituted by conceptual elements. The disciplines that are relevant in examining HTI design values are reviewed in chapter 3. First, the discipline of ICT-ethics is presented to designate the foundation connecting values to technology, and that technology is not free from values, but that values are embedded in technology. However, ethics *ipso facto* is not in the core concern of this research. The basic definitions of values and the field of value research are briefly reviewed, and the issues of ethical design and professional ethics are depicted. The measurements of values are described at the end of the chapter. The objective of the reviews is not to dispute the results achieved in earlier studies, but to discuss and expand the scope of the questions that are relevant to this research.

Chapter 4 introduces the thematic areas discussed in the articles and the main findings of empirical study. Articles represent examples of different aspects of values and the issues related to values that are relevant in terms of HTI. In chapter 5, the content-based reference frame is discussed in the context of value research, and a model of interpretation process and of the conceptual

structure of values as mental representations is suggested for being tested in future studies. Finally, in the last section, the results and research area are discussed in the framework of HTI design in general, and briefly in the larger framework of scientific progress.

2   VALUES AS MENTAL REPRESENTATIONS

The fact that values are both concrete and abstract create a challenge to value research. Individuals refer to values in ways that are abstract, but when they are applying values, they must do so concretely. Therefore, in this dissertation, the basic assumption is that the existence of values at both those levels is understood by explicitly regarding values as mental representations; among other features, values vary in concreteness, accessibility, connections to other constructs, and their applicability to other judgments. Since the development and application of any value should be intricately connected to development and application of other values, this notion is important for comprehending values as mental representations.

In attempts to provide more specific measures of values, the abstract nature of values is clearly crucial to their conceptualization: They are used at abstract levels in real-life contexts. Therefore, it is possible, for example, for politicians or business leaders to utilize the broad nature of values to gain agreement from diverse factions. For most people, it is difficult to disagree with ideals like freedom, peace, or equality. These kinds of ideals can be useful categories for comprising various interests (Edelman, 1985), but to understand this role of values, more should be learned about values because they are abstract in peoples' minds. Mental representations are active states in the human mind. If an individual does not have any mental representation of a particular value, he or she cannot have experienced or concretely substantiated it. When the objective is to understand the existence of values in the human mind, the contents of individual's mental representations must be analysed by focusing on the concepts that the individual is attributing to particular values, and then analysing the relationship between these concepts.

2.1   Mental Representations

Representationalism is the view, according to which representations are the main way individuals access external reality. Representational theories of the mind, which go back as far as Aristotle, start with the notion of commonsense mental states, such as thoughts and perceptions, and understand that thinking occurs within an internal system of representation. The dominating contemporary version of the Representational Theory of Mind (RTM), the Computational Theory of Mind (CTM) (Turing, 1936, 1950; Newell & Simon, 1972; Fodor, 1975), states that the brain is a kind of computer, and consequently, mental processes are computations. The historical foundation for approaching the human mind as a computational system derives from Turing (1936) and his definition of computation and absolute limitations on what computation can achieve. Turing's (1936) core idea depends on the *self-reference* involved in a machine operating on symbols, which is itself described by symbols and so can operate on its own description. Turing's formulation of *computability* encompasses "the possible processes which can be carried out in computing a number" (Turing, 1936). This established new fields in practical computation and started the discussion about human mental processes.

The notion of mental representation is, however, arguably in the first instance a theoretical construct of cognitive science. As such, it is a basic concept of CTM, according to which cognitive processes and states are constituted by the prevalence, transformation, and storage of information processing structures. RTM advances CTM by attempting to explain all psychological processes in terms of mental representation, by constructing empirical theories of human cognition and developing models of cognitive processes that can be implemented in artificial information processing systems. The commonsense mental states, such as thoughts and perceptions, can be seen as the starting points of RTM. These states are argued to have intentionality: They are *about* or *refer to* things, and therefore can be evaluated with respect to properties like consistency, truth, or accuracy. In terms of RMT, such intentional mental states are defined as relationships to mental representations. RMT explains the intentionality of the former in terms of the semantic properties of the latter.

The propositional attitudes of the mind are conceived as mental representations with semantic properties. The original representational theory, which was a dominant theme in classical empiricism generally, probably can be traced back to Hobbes. According to this early version of the theory, mental representations were images of the objects that states of affairs represented. For modern adherents such as Fodor (Fodor & Pylyshyn, 1988; Fodor, 1997), the representational system consists rather of an internal language of thought. The contents of thoughts are represented in symbolic structures that possess a syntax and semantics very much like those of natural languages. In the context of the semantic contents of thought, Vygotsky's (1962) view of social origins of speech and the higher mental functions must be mentioned. His theory is characterized by

concepts of human sociability, social interaction, sign and instrument, culture, history, and higher mental functions. Vygotsky analyses the relationship between words and consciousness, arguing that speech is social in its origins and that only as children develop does it become internalized verbal thought. Learning reinforces this process by making available culture-generated tools that extend the natural possibilities of the individual and restructure his or her mental functions (Vygotsky, 1962; Schaffer, 1971; Thoman, 1979; Lamb & Scherrod, 1981).

Within contemporary philosophy of the mind, the supposition that the mind can be naturalized, meaning that all mental facts have explanations in terms of natural science, is general. The conception is also shared with cognitive science, which attempts to account for mental states and processes in terms of brain features and the central nervous system. As a result, the various sub-disciplines of cognitive science describe different structures and processes, some of which are not directly implicated by mental states and processes as conceived by commonsense. However, there is a shared engagement to the concept that mental states and processes can be explained in terms of mental representations.

Extending the notion that a representation is an object with semantic properties, like content, reference, truth-value, and so on, a mental representation may be more widely construed as a mental object with semantic properties. As such, mental representations and involved states and processes cannot be comprised only of computational terms. In broader decode, mental representation is a philosophical topic deriving from antiquity, history, and literature that predates the recent 'cognitive revolution'. Although contemporary philosophers of the mind recognise the relevance of cognitive science, they disagree about the degree of engagement with its methods and results. Therefore, for example, there remain issues concerning the representational properties of the mind that can be addressed independently of the computational hypothesis. RTM is at times used nearly interchangeably with CTM, and it can be used to indicate to theories that postulate the existence of semantically evaluable mental objects, like concepts, perceptions, impressions, notions, schemas, images, and so on.

Computational thinking is based on insight about the human mind as a computational device (Turing, 1936, 1950), in which a set of naturally meaningless symbols are manipulated by a set of functions. It is also possible to see human beings this way, as symbol manipulating devices (Newell & Simon, 1972). It is possible to posit that a computational model describes minimal conditions for a thought process (Newell & Simon 1972), because devices like calculators can perform as humans do, but the way they operate does not clarify anything about human thinking. Therefore, a content-based approach is selected as a framework for exploring HTI design values. Hence, the differentiation between computational and content-based analyses of designers' minds should be made. The meta-scientific assumption behind content-based analysis is the notion that the contents of thoughts cannot be expressed by means of computational theory languages, and therefore, the approach is theoretically independent of such

mindset. Of course, it is possible to construct computational models of human thinking (Saariluoma, 1995). Previous efforts have led to the crucial question of whether these models of computational theory language can be justified, or if there is a need for content-based theory constructions and language to determine whether the computational model is appropriate. The difficulty of computational approaches relates to the issue that if machines are abstracted, aspects of mental contents are lost. Additionally, on computational grounds, interpretations are impossible to justify. In another words, it is possible to construct simulation models that imitate the content aspects of human mind, but it is not possible to justify the models on formal grounds only. Therefore, in the analysis of human mentality, the theoretical concepts of content-based analysis are needed. HTI design (and values involved in the processes) is a representative example of a problem that cannot be created only by computational models. The foundation of differences between individuals' actions lies in the mental contents, if on a formal level. Since purely formal grounds are not appropriate for constructing such content aspects, pragmatist and constructivist views of relationships between reality and the individual whereby knowledge structures gain their contents and meanings will be briefly considered next.

2.1.1   Pragmatism and Symbolic Interaction

Pragmatists hold that reality is actively created as individuals act in and toward the world (e.g., Mead, 1934, 1936, 1938). Individuals base their knowledge of the world on what is useful, but also define the social and physical objects they encounter according to their use for them. If individuals' acts can be understood, the understanding must be based on what people actually do. These ideas are critical to symbolic interactionism:

- interaction between the actor and the world;
- both the actor and the world are dynamic processes without static structures; and
- the actor's ability to interpret the social world.

To symbolic interactionists, consciousness is not separated into action and interaction, but is an integral part of both. Mead's (1936, 1938) theories are partly based on pragmatism and behaviourism, and like Dewey (Garrison, 1998), Mead developed a more materialist process philosophy based on human action and specifically on communicative action. In a pragmatic sense, human action is a criterion of truth, and through human activity, meanings are construed. Mead's philosophical doctrine concentrates on activity, experience, and practical problem-solving. His pragmatism is known as *interactionalism* (Bredo, 2000), and besides being a theory of knowledge, it is also a philosophy of science. According to Mead's theory (1938), knowledge is derived during experimental problem-solving. As it relates to human values, pragmatism defines and explains how knowledge related to values is generated. However, the applicability of constructivist pragmatism to conceptual construction of values may be compromised.

Communication and other joint activities are the means through which individuals' senses of self are constituted. The essence of Mead's thinking is that the mind is not a substance located in some transcendent realm, nor is it merely a series of events that takes place within the human physiological structure. The emergence of the mind is contingent upon interaction between individuals and their social environments. Social acts of communication through which individuals realize their potency for symbolic behaviour, i.e., thought, occur through participation. Ultimately, the mind is the individualized focus of the communication process, and consequently, there cannot be 'mind or thought without language', and language, as content of the mind, "is only a development and product of social interaction" (Mead, 1934). Thus, the mind is not reducible to the neurophysiology of the organic individual, but instead is emergent in 'the dynamic, ongoing social process' constituting human experience (Mead, 1934).

Mead's (1938) philosophy of *the act* asserts that problem-solving in conjunction with the dictates of human interests leads to knowledge. This epistemological view supports his pragmatist theory of learning, which holds that reality is defined according to individuals' experiences when they interact with objects. An important principle can be found in Mead's *Philosophy of the Act* (1938), which endows epistemological validity to informational contents of values arising from activity. The focus is rather on individuals' needs and experiences rather than on predetermined content. Knowledge creation is situated in experience based on activities that are directed to problem-solving. However, the pragmatist view is criticized for rejecting universal truths and instead focusing on the variability of how individuals interpret their experiences (Brookfield, 2000). Pragmatism has been criticized because realist science is not based on experience (Nowak, 1994), and scientific knowledge cannot be reducible to personal psychology (Phillips, 2000). However, pragmatism is, in the first place, an epistemology equating truth with the solution of a particular problem in a particular setting.

Pragmatism as an epistemological doctrine and a viewpoint of the creation of knowledge, however, constitutes the foundation for considering human values as a type of knowledge composed of different conceptual contents that have their meanings within individuals' experiences.

2.1.2   Interactionism in Organization Studies

The mindset of symbolic interactionism within organization research warrants a brief analysis. Sociologists have long debated the role of social structure and human agency the structure of society. Nowadays, one goal of contemporary sociologists is to identify and articulate the debate between institutionalists and interactionists. However, much of organizational sociology is oriented towards a structural perspective, and it has become common in organizational sociology to treat institutions as broad symbolic systems where "rendering the experience of time and space meaningful" (Friedland & Alfond, 1991, 243) represents a

primary operating component. Previously, broad structures of meaningfulness were taken for granted in organized activity.

In organizations, meanings have to be formed, learned, and transmitted through a social process of indication (Blumer, 1969). Human groups act on the level of symbolic interaction, where people form, sustain, and transform meanings as they apply such meanings to objects. According to Blumer, meanings are sustained through indications and definitions that people make (Blumer, 1969). From this perspective, questions of how something such as values are interpreted and how their different meanings are derived through employee to employee and employee to management interactions become relevant. One form of symbolic interaction that most directly engages organizational concerns is the *negotiated* order approach (Strauss, 1978). According to this view, social order is the result of dynamic interactions or negotiations between participants. Interactions create social order, but take place in a specific context that enables, constrains, and shapes them (Maines, 1982; Fine, 1992; Hallett, 2003).

The recognition that life is embedded in social relations and contexts is relevant to institutional research. Exemplifying this are local negotiated orders that situate and define how the employees should view their work and existing organizational relations and structure. The symbolic interaction meaning, on the other hand, views social relations as situated interactions. The contemporary institutionalist sees meaning as being more implicit and treats it in the abstract, as public culture. However, a holistic view on institutions requires a consideration of both. In more traditional institutionalism the actions of individuals can be viewed as a function of interests and structural positions within a hierarchy, whereas more recent institutionalism, as extended and refocused, emphasizes meaning and cultural practices, thereby paying less attention to the inter-organizational dynamics (DiMaggio & Powell, 1983; Lounsbury & Ventresca, 2002; Armstrong, 2002).

Institutionalism today, however, has started to come closer to symbolic interaction. These efforts are mainly conceptual, and the significance of symbolic interaction has not been fully recognized by institutionalism. Institutionalist and interactionst sociologists will likely continue to address different questions based on their own differing perspectives.

2.2   Content-Based Approach

Professional practices in HTI design and thinking processes practices concern various tasks that may be related to organization (business strategies, efficiency, production facilities), products (development, process variables, product specifications, internal standards, norms and instructions), or design (personal professional scientific and technological knowledge, beliefs) (Nevala, 2005). All these areas require decision-making and therefore values should be taken into consideration while one is making decisions, since they function in constituting the motivational foundation for such decisions. In HTI design, thinking values

can be seen as part of thought processes and a sub-function in problem-solving activity. In examining HTI, the focus has traditionally been on the technological contents of design, meaning the application of certain technologies and practices (Suh 1990; Lindemann 2005; Saariluoma & Nevala, 2006; Saariluoma, Nevala & Karvinen, 2006; Saariluoma, Kaario, Miettinen & Mäkinen, 2008). Similarly, within cognitive science, another approach to the subject has developed (Simon 1969; Akin 1990; Cross Cristiaans & Dorst, 1996; Kavalki & Gero 2003; Tversky 2003; Visser 2003) that is characterised by use of psychological concepts. In HTI design thinking, values can be comprised as a certain type of mental contents of thinking (Saariluoma, 1990, 1997, 2001, 2003a).

For examining mental contents, a content-based approach offers an appropriate reference framework for research. The approach was developed by Saariluoma (Saariluoma, 1990, 1995, 1997, 2001, 2003a; Saariluoma & Nevala, 2006), and it aims to explain human behaviour in terms of the information contents of mental representations and processes that are needed to construct these representations. In an individual's thinking processes, cognitive resources are always filled with conceptual material. These contents of thought differ in different situations, and can also interact with emotions. When the focus of research is on the information contents of mental representations, the objective is to explain why mental representations have a particular set of content elements that are linked to a entirety, and why some equally possible sets of elements are not included in a particular representation (Saariluoma, 1995). Mental representations are usually constructed with two kinds of information contents, perceivable information and non-perceivable information (Saariluoma, 2002), which explains the differences between interpretations of the subject of mental representation. To comprehend the phenomenon, attention should be paid to individuals' psychological processes. A content-based approach to human thinking is based on foundational analysis (Saariluoma, 1997). In foundational analysis the objective is to clarify the theoretical and conceptual foundation of specific disciplines. Investigation focuses on the explicit and tacit assumptions that are built in to the argument for the research tradition. The goal of foundational analysis is to improve the quality of argumentation by eliminating conceptual confusions, flawed beliefs, illusory assumptions, and presumptions in the knowledge structure. Saariluoma has construed the significance of conceptual analysis in his book *Chess Players' Thinking* as follows:

> Scientific concepts are building blocks of our theories. Concepts are the entities which distinguish intuitive knowledge from scientific knowledge and which organize scientific experience. They define what is essential and what is inessential in a particular context and provide the propositional knowledge with content. The concepts refer to something and enable people to separate their references out from all other available objects or actions, thus forming the very basis of human thinking. Concepts give the thoughts their contents, and by using spoken or written language people transmit these thoughts to each other (Saariluoma, 1995, 8).

A content-based approach closely connects empirical investigation and conceptual analysis. By means of conceptual analysis and through experimental work, the explanatory power of concepts can be tested. In addition to chess playing, a content-based approach has been recently applied to research concerning, for example, design and engineering (e.g., Saariluoma 1990, 1995, 2003a; Saariluoma & Maarttola, 2001, 2003a, 2003b; Nevala, 2005). Saariluoma's content-based approach (Saariluoma, 1990, 1995, 1997, 2001, , 2003a; Saariluoma & Nevala, 2006) differs from Carroll's (2006) content-oriented approach: Within the first, objective methodology is used and the principles of modern psychology are followed. A content-based approach also differs from the content-oriented approach suggested by Newell and Simon (1972) and Allport (1980). Content-oriented research aims to model mental contents, while a content-based approach aims to explain human behaviour on the basis of the information contents of mental representations (Saariluoma & Nevala, 2006), which constitutes the explanatory ground for exploration. In addition, a content-based approach utilizes a third-person perspective to thinking processes, studying these processes empirically instead of relying on introspective experiences. Within the exploration of human mentality, a content-based approach also differs from a capacity-based approach (Saariluoma, 1995), which is typically used in a context of researching memory and attention in studies of the limits of the human information processing system (e.g., Broadbent, 1958; Atkinson & Shiffrin, 1968; Norman, 1969; Baddeley & Hitch, 1974). In Saariluoma's view, capacity cannot make a difference between thought contents (Saariluoma, 1997). For example, in the case of human values, the differences in various interpretations of such values that individuals associate with particular words like 'peace' or 'justice' cannot be explained on the basis of capacities for memory or attention. To understand the differences of interpretations, the contents of thought must be analysed.

In a content-based approach, a distinction is made between mental representations and processes operating on these representations. Mental representation applies to information that is available to use, while process refers to dynamic use of information (Billman, 1998). In a content-based approach, the most important processes are *apperception*, *restructuring*, *reflection*, and *construction* (Saariluoma et al., 2006). Apperception constitutes individuals' immediate mental representations, restructuring refers to the shift from one particular mental representation to another, reflection directs the comparison and selection between alternative mental representations, and construction integrates groups of sub-representations into a consistent whole. It should be noted that these thinking processes do not need to be subsequent.

When human values are the focus of research, apperception, restructuring, reflection, and construction can be seen as sub-processes, i.e., cognitive processes through which mental representations are constructed and the different interpretations of values can be reached. In the study of values as mental representations, it is also important to note the fundamental functions of the memory system, because evidently it is a crucial element in thinking. It is both a precon-

dition to thinking and the basis for mental representations (Baddeley, 1966; At-kinson & Shiffrin, 1968; Tulving, 1972, 1983; Saariluoma, 1995). Although content-specific sub-processes of thinking—apperception, restructuring, reflection, and construction—receive more attention in a content-based approach than do the processes of memory, these processes are closely linked with the memory system. However, detailed discussion about memory processes is not included in this study, although values are associated with both our individual experiences and general knowledge. For instance, values can be seen both in individual conceptions, colored by an individual's history, or as a construction of culture-historical knowledge. To some extent, these two types of memories are compounded. When professional values are studied, it is reasonable to assume that experts use field-relevant knowledge as part of their interpretations, while less experienced individuals lean more on personal memories and may utilize more easily generalized, historically determined knowledge in their interpretations.

Recognition and recall are typical themes related to the functions of memory (e.g., Saariluoma, 1995), since they play an important role in individuals' interpretations. In the case of values, for example, concepts such as 'peace', 'justice' or 'equality' are familiar to most people. If they were asked to verbally describe these concepts, it is probable that the attributes and meanings attached to value concepts will differ, and there might even be great differences between the individuals' descriptions. Cognitive recall is a more challenging task than recognition; in recognition, individuals focus only on some informative and discriminate elements of an object, but in recall, several important elements of the object must be recalled (e.g., Saariluoma, 1995). Also the terms *schema*, *prototype*, and *category* must be mentioned (e.g., Solso, 2003) in the context of this study. Schemes provide a context wherein human experiences are structured and comprehended by representing the general structure of an object, idea, or relationship between concepts. Schema is therefore a part of an individual's framework for representing knowledge. In the context of values, there may be schemes like ethical values, cultural values, work values, and personal values. When particular values, for example 'equality' or 'efficacy', are conceptualized, some of these schemes are activated. Instead, prototypes are general abstractions of the object against which schemas are evaluated (Rosch, 1977). Schemes, prototypes, and categories are abstract knowledge structures in the human mind. In this study, attention is directed to the information contents of these knowledge structures.

In short, memory is the basis for representations of thoughts and a precondition for thinking. However, it cannot alone explain the differences in interpretations or conceptualizations of values. Therefore, human information processing should be studied more carefully, starting with apperception.

2.3 Apperception

In philosophy, debates about mental representation have focused on the existence of propositional attitudes, such as beliefs, and the determination of their contents in mental representations, i.e., how they come to be about what they are about. In addition, the question of the existence of phenomenal properties and their relationship to the content of thought and perceptual experience has been disputed. During the last few decades, apperception has been accepted as a useful theoretical concept for understanding the activities of mental representations (Saariluoma 1990, 1995, 1997, 2002). Nevertheless, the concept was proposed by Leibniz in 1704 (Leibniz, 1704/1965), and since then has been applied in different contexts by authors such as Kant and Husserl. In Leibnitz's writings, the concept apperception is distinguished from perception in the sense of conscious perception of something. With this distinction, Leibnitz indicates that there are also unconscious perceptions. He illustrates the functions of these *petite* perceptions through the example of the sound of the sea (Leibniz, 1704/1965): The sound of the sea can be apperceived, but one cannot be conscious of the sounds of individual waves. The same applies in the context of value-related information processing. Possibly one cannot be conscious of all motives or other factors related to a certain value, but one can apperceive the value that is constructed through these motives and other factors. Regardless, apperceiving something implies that attention must have been focused on something, and therefore one's memory also has to be active.

Kant's (1781/1974) view of apperception (*apperzeption*) is combined with the concept of imagination, a sub-process of apperception that is seen as the highest principle in human cognition. Self-consciousness requires the synthesis of various representations, according to Kant: One cannot represent anything as being joined to the particular object without having first joined it oneself. The Kantian view of apperception gives a synthetic unity to human experiences by creating a synthesis between one's different representations and integrating different stimulus with the categories of human understanding, such as time and space. What is essential from the viewpoint of mental contents is that one's earlier experiences are assimilated into one's perceptions through apperception. Similarly to Kant, Husserl (1936) comprehended apperception as an ability that gives continuity to human experiences. In Husserl's view, apperception is not the opposite of perception (Husserl, 1900/1970), but instead is an immediate act of understanding. According to Husserl, every perception provides apperception. The elementary experience of stimulus is a foundation for apperception. The initial stimulus presents itself in subsequent experiences of the same object. In reverse, the matter that has been once apperceived never becomes an object of perception that achieves actual existence. A process uniting separate perceptions is analogizing apperception, in Husserl's view (1931/1982). This analogizing can be done, for example, by pairing or by the phenomenon of plurality. When Husserl's definition of analogizing apperception is considered in the con-

text of human values, it provides understanding of how one's perceptions of certain values transform into abstract units, such as judgments of acceptability or goodness.

Church (2000) has studied Kantian imagination through the problem of explaining how the disparate contents of human experience can be bound together and transformed into a unified consciousness of the world. Within the problem, three levels can be distinguished: First, how human experiences of different types of properties get bound together into the experience of a single object; second, how the experiences of objects get bound into the experience of a single world; and third, how different experiences get bound together into the experience of a single subject. The Kantian definition of apperception posits that an experience of human value is significantly wider than just the pure conceptual stimulus attached to it. For example, if a person is considering some individual value concept such as *equality*, his or her experiences of other conceptual or experiences related to it may synthesize with his or her experience of a particular concept.

Thus, previous definitions of apperception clarify that it organizes the individual's (conceptual) perceptions by incorporating into them elements that make the perceptions reasonable. From the viewpoint of a content-based approach, the concept of apperception clarifies the understanding of mental representations. Saariluoma (1995, 2002) incorporated the concept of apperception into the representational theory of the mind. Apperception is a process that assimilates perceptual information and conceptual knowledge into self-consistent mental representations and integrates perceivable content elements with the non-perceivable; mental representations are constructed through apperception. Accordingly, it synthesizes different types of representational contents into the representations, providing them reasonable structure (e.g., Leibniz, 1704/1965). Through apperception, it is possible to determine the differences within mental contents of individuals with their differing life experiences. It defines individuals' personal experiences, both cognitive and emotional. From a content-based view, mental representations can are integrated wholes of cognitive and emotional content elements. According to Saariluoma (2003b), concepts with emotional contents can be used when one is speaking of the part of mental representation that is caused by the activation of emotions. The process of apperception through which mental representations are constructed can either be led by the individuals' cognitive concepts or emotions, since cognitive and emotional content elements are usually closely linked. However, emotions have a significant role in apperceptive processes because they unite the individual's experiences (Haviland-Jones & Kahlbaugh, 2000). They can connect separate experiences that share emotional processes, and introduce an individual to new experiences. From a content-based viewpoint, this means that emotions can function as a link from one experience to another, as cognitive concepts do.

The relationship between emotion and memory can be seen in similar ways. Emotion is a characteristic of the contents that is remembered, or it can be characteristic of the psychological state of the person who remembers (Parrott &

Spackman, 2000). In the latter case, emotional states may affect when memories are being formed (encoding) or when they are recalled (retrieval). A phenomenon related in the memory-emotion relationship is mood-congruent recall, which means that when one is in a particular mood, one is prone to recall memories congruent with that mood. According to Parrott and Spackman (2000), the associative-network theory introduced by Isen, Shalker, Clark & Karp (1978) and further developed by Bower (1981) explains mood-congruent recall: Memory can be modeled as a network of concepts linked together to depict an event. Concepts are represented as associations and nodes between the concepts, linking them together. When an individual is aware of a particular concept, the nodes that correspond to the concept activate above a particular boundary, and the activation spreads throughout the network (e.g., Parrott & Spackman, 2000). It seems that mood-congruent phenomenon may be important in the context of the experience of values, since it explains why individuals tend to apperceive the same values in different ways.

Since mental representations are constructed through apperception, they are combinations of objects' perceivable properties to which one's attention is directed and mental contents associated with these objects because of one's previous experiences. The fusing of contents apperception to mental representations can be partly subconscious, such when an individual apperceives a view of a landscape in a picture, which is construed through details, without being conscious of some singular details. Therefore, to fully understand the nature of human experience of values, the subconscious contents of mental representations should be studied. However, in this study, the focus is on the conscious part in conceptualizing values, on the relationship of conceptual contents, and on scrutinizing the interpretation processes of values.

The role of apperception in experiencing and constructing the meanings of values is stressed. However, it could be asked whether apperception is an indispensable concept in examining conceptual information processing. If an individual's experience of values is approached merely through the concept of perception, the differences between individuals' interpretations would be difficult to explain. People tend to use concepts differently when they are considering the same value concepts. Apperception and its sub-processes such as restructuring, reflection, and construction develop these differences, since they mix information associated with value concepts with individual's personal experiences. It is reasonable to hypothesize that individuals organize their perceptions of values through abstract, non-perceivable concepts, and thereafter, through the use of abstract concepts they construct rational relationships between the conceptual elements related to a particular value concept.

Although it is obviously possible to discuss construction of mental representations without the concept of apperception, it seems to be a functional analytical concept in the examination of mental representations. Nonetheless, the concept is essential from a psychological viewpoint, since it is important to differentiate the processes that operate on representations. Apperception has a role

in clarifying the difference between perception and those cognitive processes that organize an individual's perceptions.

2.4   Conceptual Elements in Mental Representations

Within realists' traditional assumptions about mental representations, representational states come in two basis varieties (Boghossian, 1995). Some thoughts are composed of concepts, having no phenomenal, 'what-it's-like' features (qualia), and some such as sensations have phenomenal features but no conceptual foundation. Mental states can be either analogous to natural language or to visual stimulus, like pictures, in this classification. For example, in the context of human values, a perceptual state such as experiencing something as important can be thoughts of a hybrid state consisting of a non-conceptual belief and sensation, or can be a more integrated combination of conceptual and non-conceptual elements.

There is no consensus about the format of mental representations. Disputes over non-conceptual representation concern the existence and nature of phenomenal properties and their role in determining the content of sensory experience. For example, Dennett (1988) denies the existence of such qualia, as they are regularly construed. Rey (1991), McDowell (1994), and Brandom (2002), for example, deny that qualias are even needed to explain the content of sensory experience. Historical discussions about representational properties of mind (e.g., Aristotle, circa 330 BCE/1984; Locke, 1689/1975) reflect the assumption that non-conceptual representations, percepts, are only types of mental representations. The mind represents the reality of being in a state of resembling things in it. Therefore, representational states have contents by virtue of their phenomenal features. This view is criticized for lack of generality (Berkeley, 1975) and non-compositionality of sensory and imagistic representations (Fodor, 1981). There have been discussions also about the claim that conceptual representations lack phenomenology. It is claimed that purely conceptual representational states themselves have a phenomenology (Flanagan, 1992; Searle, 1992; Goldman, 1993; Chalmers, 1996). This claim raises the question of what the role of phenomenology is in determining content that re-appears for conceptual representation. Debates have also concerned the issues of whether mental imagery is a pivotal concept in psychology that strives to explain human information processing. The advocates of imagery have claimed that the concept of mental images should not be abandoned (e.g., Wraga & Kosslyn, 2003), whereas opponents assume that it is possible to converse about these images by means of propositional code. Examining mental contents of values, the propositional approach (e.g., von Wright, 1963) seems reasonable, since in individuals' minds the concepts that are related to a particular value are not necessarily conceptualized, yet are conscious. However, to arrive at information about the contents of values, they must be studied in terms of these contents.

2.4.1   Representational Mind

The Language of Thought Hypothesis (LOTH) postulates that thought and thinking take place in a mental language that consists of a system of representations that is physically realized in the individual's brain and has a combinatorial syntax and semantics. According to LOTH, thought is, roughly, the tokening of a representation that has a syntactic structure with appropriate semantics. Consequently, thinking consists of syntactic operations defined over such representations. LOTH refers to Fodor's (1975) hypothesis that described thoughts as represented in a language that allows complex thoughts to be construed by combining simpler thoughts in different ways. In its most basic form, the theory states that thought follows the same rules as language—thought has syntax.

LOTH states that thinking takes place in a mental language, i.e. in cognitive processes expressed as a system of representations that are linguistic or semantic and operate through combinatorial syntax (Fodor & Pylyshyn, 1988). Linguistic tokens used in mental language describe elementary concepts that operate by logical rules, establishing causal connections to allow for complex thought. Both syntax and semantics have a causal effect on the properties of this system of mental representations. LOT is supposed to exist at the cognitive level of thoughts and concepts, and it can be comprehended as a version of functionalist materialism (e.g., Marr, 1982; Block, 1996), which holds that mental representations are actualized and modified through individual holding of the propositional attitude. An objection challenges LOTH's explanation of how sentences in natural languages get their meanings. LOTH implies that the mind has tacit knowledge of the logical rules of and the linguistic rules of syntax and semantics (Crane, 2003). If LOTH cannot show that the mind knows that it is following the particular set of rules in question, then the mind is not computational because it is not governed by computational rules (Crane, 2003; Ayede, 2004). Also, incompleteness of such a set of rules that ought to explain behaviour is designated: Conscious beings behave in manners contrary to the rules of logic. Irrational behaviour is not accounted for by rules, which implies that at least some behaviour does not conform to this set of rules (Crane, 2003). Another objection within the representational theory of the mind has to do with the relationship between propositional attitudes and representation. Dennett (1988) has demonstrated this problem by pointing out that a chess program can have the attitude of 'wanting to get its queen out early' without having a representation that explicitly states this. A multiplication program on a computer computes in the computer language of 1s and 0s, yielding representations that do not correspond with any propositional attitude (Ayede, 2004).

It is relatively uncontroversial that minds represent the world. For example, the mental imagery debate was largely sparked by the results of experimental work in psychology that suggested that subjects were rotating and scanning internal pictures at measurable rates. The more recent literature concerning the topic (e.g., Kirsh 1991; Clark 1993) argues that there is no clear, absolute distinction between the explicit and inexplicit representation of infor-

mation. Encryption of English sentences, for example, can yield representations that have all the same features as English sentences but do not appear to represent their contents explicitly. With skill, however, some readers might be able to decrypt on sight, without laborious processing. However, natural human languages provide rich and powerful representational systems. One of the distinguishing commitments of contemporary cognitive science, particularly as contrasted with behaviourist psychology, is that inner representations cause and explain behaviour. Mental representation thus holds a crucial place in the contemporary study of the mind. Understanding mental representation will make a significant contribution to the theoretical underpinnings of all the cognitive sciences.

2.4.2   Categorization of Concepts

In psychological literature, the cognitive structures underlying categorical judgments are generally referred to as *concepts*. In psychology, as well as in philosophy, there is a traditional view that concepts must specify necessary and sufficient conditions. Since the early 1970s, growing trends in experimental literature have challenged this classical view of concepts (e.g., Rosch, 1978). There are indications that individuals can reliably order instances under a concept when asked how 'typical' or 'representative' the instances are. For example, an apple will be rated a more typical fruit than a lemon, and a lemon will be rated a more typical fruit than an olive (Mervis, Caitlin & Rosch,1976; Rosch, 1978; Malt & Smith, 1984). These kinds of ratings predict performance on a wide variety of tasks, including categorization. In addition, when participants are asked to generate examples of subcategories of a given concept, typical ones are mentioned before atypical ones are (Rosch, 1978). If a concept is the cognitive structure subjects are using while making categorical judgments, then previous results make the classical view of concepts look problematic. If concepts specify necessary and sufficient conditions, they should apply equally to all instances of the concept, but it is not clear why particular instances should be more typical, easier to recall, and easier to categorize.

According to more recent notions, concepts are comprised of basic elements of mental representations that help people deal with a number of stimuli in various contexts. Concepts have both internal attribute structures and external structures of inter-conceptual relationships (Saariluoma, 1995, 2002). Both the inter-conceptual relationships and attributes can be conveyed in propositional form (e.g., von Wright, 1963). However, at this point, the distinction between atomistic and propositionalistic theoretical frames should be made. Generally, an atomistic view claims that the world consists of a plurality of independently existing things exhibiting qualities and standing in relationship (e.g., Russell, 1921; Wittgenstein, 1922; Carnap, 1934/1937). According to logical atomism, all truths are ultimately dependent upon a layer of atomic facts that consist either of a simple particular exhibiting quality or multiple simple particulars standing in a relationship. However, the psychological method of lexical semantics focused on representations of word meaning. Within this tradi-

tion, concepts are studied through their expression in commonly used words. Tradition is based on the work of Frege (1952), and interest has concentrated on how the intensions of concepts are related to their extensions. Intensions refer to aspects or *attributes* of a concept that might be involved in categorization. Extensions refer to generating categories of category members. Attributes themselves are concepts referring to necessary or accidental properties of concepts, while inter-conceptual relations are define as the relationships between independent concepts. These structures form the contents of concepts. Since concepts are dynamic units, their contents are constantly changing through both individual and historical development. This means, for example, that the concepts of experts differ from concepts of novices (Saariluoma, 2002). Also, Bal has discussed the flexible nature of concepts. Concepts move "between disciplines, between individual scholars, between historical periods, and between geographically dispersed academic communities" (Bal, 2002, 24), and between these 'moves', the meaning, reach, and operational value of concepts may vary. Nonetheless, from a context of a content-based approach, concepts serve as elements of mental representations.

According to a constructive approach to concepts, they have two stages, potential and actual, in the human mind. Saariluoma (2002) has suggested that there is an extensive set of concepts with extensive sets of associated attributes in one's long-term memory. This potential quantity of concepts forms a basis for construction of all representations. The sum of all attributes that can be associated with a particular concept forms the total content of the concept. When a concept is incorporated into a representation, all the related attributes cannot be relevant, since concepts have in many cases attributes that are contradictory. For example, propositions typically include a quite narrow set of conceptual attributes. In Saariluoma's view, this active set of attributes that are relevant in a particular representational context can be called the use of concepts. Concepts are therefore elements through which propositions are constructed, and their content can be considered contributions that they supply to representations in which they are involved in. For example, a concept of dog has several conceptual attributes. Dogs are animals, they are mammals, they have tails, they can hunt, they vary in color and size, and so on. These attributes can be inferred from the concept of dog, since all attributes that can be associated with the concept form the concept's total meaning. Yet, when one is thinking about a representation of a singular dog, all the possible attributes cannot be equally relevant. In many cases, the contents of mental representations can be constructed by both visual and conceptual elements. In the construction of mental representations, visual signs transform into concepts that can have both conceptual and visual attributes.

The case of the dog represents an example of the typicality effect that can be explained by appealing to properties that are common to members of a category, though they are not necessarily conditions for membership in the category, that Rosch and her associates call the *family resemblance score*. A family resemblance score for a particular kind of dog is a sum of the weights of the

properties mentioned for that dog. Obviously, this scoring turns out to be a good predictor of typicality, and thus a good predictor of categorization speed and recall. Another suggestion for dealing with results like those from Rosch's (1978) fruit case posits the mental representation of one or more exemplars that is a particular instance of an item falling under a concept. According to this view, categorization proceeds by activating mental representations of one or more examplars for the concept and then assessing the similarity between the exemplars (Estes, 1986). However, more recent studies suggest that neither the prototype approach nor the exemplar approach can explain the conceptual representation, even for a simple concept like 'dog'. It seems that conceptual representation is a complex affair combining prototypes or exemplars with more theoretical features. It also seems that mental representation operates differently in different domains. Therefore, the mental representation of, for example, social concepts such as pacifism or communism may have a format that differs from the mental representation of a dog (Barsalou, 1987).

Apparently, the classical view of necessary and sufficient conditions has little or no role in the categorization process, which becomes more evident if the objective is to explore conceptual contents of mental representations of abstract concepts, such value and moral concepts. Naturally, all values are not moral values, but judgments are been made based on values, whether they are moral or non-moral values, which equate non-moral value concepts to moral concepts and makes their concurrent examination relevant.

2.4.3   Conceptual Contents in Mental Representations of Values

The tradition suggesting that a different account of how moral judgments are made derives from philosophical literature. Instead of relying on something akin to definitions, moral judgments are assumed to originate from an interconnected set of rules or principles that specifies which actions are just or unjust, desirable or non-desirable, and permissible or not permissible.

In *A Theory of Justice*, Rawls (1971) recommends that a primary goal of moral philosophy should be to discover the set of rules or principles underlying one's reflective moral judgment. Along with one's belief about the circumstances of particular cases, these principles should entail intuitive judgments one is inclined to make about the case, at least in instances in which judgments are clear. Obviously these kinds of principles are not fully available to conscious introspection. In Rawls' view, the method for uncovering the system of principles that presumably underlies one's intuitive (moral) judgments is analogous to the method that is used in linguistics. According to Chomsky (1979), speakers of a natural language have internalized a system of generative grammatical rules that have not only a central role in the production and comprehension of language, but also in the production of linguistic intuitions that are the basis for making spontaneous judgments about grammaticality and other linguistic properties. In addition to internalized rules, memory, attention, motivation, and other cognitive factors interact in the production of such judgments. In the instance of moral principles, rules presumably capture only the clearest intuitions

that may be ignored if other factors distort one's judgment. After all, humans' sense of justice cannot be adequately characterized by commonsense percept (Rawls, 1971), such as the analogy between grammar and ethics. Yet plenty of the fundamental structures of the grammar that children internalize must be innate, which suggests that in understanding mental representations more deeply, it is possible to find that they sustain a similar sort of argument from the poverty of the stimulus (Chomsky, 1979). However, many of the beliefs or knowledge systems such as value systems are at least somewhat analogous to moral systems. In these cases, people can present a complex and systematic conceptual frame of judgments about specific cases, with little or no conscious access to the principles or mechanisms behind these judgments.

The construction process of mental representation is somewhat different from more concrete concepts if we examine the contents of mental representation of abstract concepts, such as values that function as the basis for making judgments and decisions in everyday life. The expression *abstract concept* refers here to concepts that do not refer to any perceptual object. Representations' non-perceivable (non-conceptual) content elements are in these cases more emphasised. The distinction between perceivable and non-perceivable content elements is important in scrutinizing mental representations (e.g., Saariluoma, 2002). Non-perceivable concepts have no physically perceivable equivalents. Instead, their equivalents are abstract concepts. These types of concepts have equivalents in physical world such as representation of a concept as behavioural actualizations. For example, the value concepts success, equality, and justice have different types of actualizations in the physical world, depending on their contents. Although value concepts are quite problematic in the sense that their contents can be highly abstract, every value concept has a set of attributes. Yet some notions of these non-perceivable contents—or invisible qualities of mental representations—should be made. The meaning of values' non-perceivable mental contents depends on interpretation, but on the other hand, the meaning derives from distinct strategies that individuals use in rationalizing their mental representations through apperception. From the perspective of a content-based approach, the differentiation between perceivable and non-perceivable concepts is important, since it is comparable to the distinction between perception and apperception: Apperception integrates non-perceivable contents into one's mental representation based on one's earlier conceptual knowledge (Saariluoma, 2002). The use of non-perceivable concepts usually requires combining information received through different resources and cultural-historical knowledge.

Based on the nature of values as abstract concepts, the entities they represent exist in an individual's network of concepts, i.e., different types of conceptual content elements associated with mental representations and referring to a certain value concept. The conceptual contents of mental representations refer to meanings of particular entities constituted through interpretation processes in individuals' minds. Previous instances seek to explain what meaning is, or what the meaning of expressions in a language consists of. However, what constitutes mental content is a complex issue. In addition to different types of con-

ceptual elements, when comprehended psychologically, values appear to have two components: a motivation-related component (valuing) and content, that which is valued. In principle, one can hold the same motivation (valuing) toward different content, and different attitudes toward the same content. For an motivation to have as its content a particular proposition, it must play a particular role in cognition, and to conceive of that conceptual content is to be prepared to make certain inferential shifts.

2.5   Measuring Mental Representations of Values

Through analysing conceptual contents, it is possible to study the meanings of values in particular contexts. Mental representations are typically studied by means of protocol analysis (Ericsson & Simon, 1984/1996), which is used in settings wherein participants perform cognitive tasks, and while doing so, they are asked to think aloud. The method has a relationship to construal cognitive linguistics, which assumes that linguistic expressions are closely joined to certain ways of perceiving situations or given scenes (Lee, 2001). Despite the criticism about participants' ability or will to report (e.g., Beyerlein & Markley, 1991), protocol analysis is still suitable for investigating mental contents. Mental representations can also be studied through interviews, but the interview questions might direct the participants' thoughts. Additionally, given answers do not necessarily reveal the immediate process of thinking. More likely, they present the outcome that is formed through these processes. Such data allow possibilities to analyse the conceptual structures of representations and to acquire more comprehensive understanding of processes underlying the conceptions of values.

By conceptual means of a content-based approach, those cognitive processes underlying the conceptions and mental representations of values can be examined. Nonetheless, without mental representation, there are no comprehensions. Apperception is the key term, meaning assimilating information with cognitive content elements stored in short-time memory. In addition to apperception, which can relatively well explain one's comprehensions of values, considering the functions of restructuring, reflection, and construction is essential to study. Restructuring refers to the shift from one immediate mental representation to another, reflection controls comparison and selection between alternative mental representations, and construction integrates larger groups of sub-representations into a coherent whole.

To provide more specific measures of values, their abstract conceptual nature is important in their conceptualization. For attaining deeper understanding of the issue and the role of values in different contexts, for example in HTI design, how they are represented in the abstract in peoples' minds should be more closely studied. There are suggestions that evaluative judgments generally arise from one's beliefs concerning an object, feelings about it, and previous behaviours toward it (Zanna & Rempel, 1988). There is also evidence that abstract

values are weakly supported by cognitive information, but instead are strongly related to affective reactions. Tests have been performed to measure whether the speed of judging the importance of a value is affected by its motivational relationship to a previously presented value in a manner equivalent to Schwartz's (1992) model. The results infer that the speed of judgment after a prior judgment reflects the degree of association between the two judgments in memory (Ratcliff & McKoon, 1981; Fazio, Sanbonmatsu, Powell & Kardes, 1986; Pakizeh, Gebauer & Maio, 2007).

Values seem to be strongly related with values that provide opposing and congruent motives. Activation of a single value may remind an individual of the importance of both opposing and congruent values. Hence, the activation of a value may exert a pattern of effects on attitudes and behaviours that are related to values. Mental representations of motivational interconnections between values have strong implications for predicting the effects of activating values on subsequent behaviour; more specifically, mental representations of relationships between values are supposed to lead to effects extending beyond behaviour that is directly relevant to the primary value. This presumption has been tested in experiments focusing on the ideals of achievement and helpfulness. Participants succeed better in solving word puzzles if they read an article reminding them of the importance of achievement before attempting the task (Bargh, Lee-Chai, Barndollar & Trotschel, 2001). They were also more helpful toward a person who was organizing the tests if a prior task reminded them of the importance of helpfulness (Macrae & Johnston, 1998). Similar effects have been observed in research in which social value constructs were primed (Roccas, 2003). Also similar patterns of activation were revealed in experiments that exposed the effects of primed values along the dimensions of Schwartz's circular model of values (Maio, Pakizeh, Cheung & Rees, 2009). According to the results of these experiments, priming a set of values increased behaviour that affirmed the values, while it decreases behaviour that affirmed a set of opposing values. The importance of this consistency of pattern across diverse behaviours lies in the fact that behaviour that perfectly assesses each value-relevant motive does not exist. Therefore, based on the notion of consistent pattern of activation, it is reasonable to assume that values are mentally represented in the sense of latent motivational conflicts with each others, as predicted in the circular model of values (Schwartz, 1992).

If mental representations of values involve motivational compatibilities and conflicts between values, changes in the importance attached to any abstract value should cause changes throughout the value system. When the importance of a particular value increases, values that are viewed as serving conflicting motives should become less important. For example, as predicted in the circular model, valuation of independence and freedom denotes a self-direction motive. Hence, if any instance causes an individual to increase the importance of those values, presumably he or she will increase the importance of other values promoting self-direction. Similarly, such an instance presumably decreases the importance of values expressing opposite motives, such as modesty, but

causes no effect on values promoting orthogonal motives like ambition or wealth. The examination of effects of value change has been performed (Cileli, 2000; Klages, 2005; Sheldon, 2005; Verkasalo, Goodwin & Bezmenova, 2006), but the systematic implications have been scrutinized only recently. Nonetheless, evidence for such patterns across diverse values requires research into the broad effects of value change based on compatibilities and conflicts between mental representations.

Since Schwartz (1992) presented his circular model of values, examinations of diverse processes related to values have shown that the model accurately reflects an individual's mental representations of values. The coherent patterns in the accessibility of values from memory, judgments of value argumentation, effects of value priming on behaviour, and patterns of value change are predicted in the model. The findings show that the level at which values are interconnected via the motivational goals that the values expressed are included in mental representations of values. Furthermore, the findings contribute to a framework for comprehending values, and perceiving people's processing of any certain values is linked to other values functioning in the background.

3   VALUES AND TECHNOLOGY

Ethical questions related to information technology are traditionally focused on particular ways that technology is used or ways to regulate such uses (e.g. Bowen, 2009). There are also notions that computer systems and software are not morally neutral, and their tendencies to promote certain moral values and norms can be identified (e.g., Nissenbaum 1996, 1998; Flanagan, Howe & Nissenbaum 2008). For example, property rights or issues related to privacy can be supported or impeded by computer programs. Behind every solution in software and other technology related development are individuals who make these choices. Exploring the human values behind these choices is crucial to acquiring better understanding of the influencing factors that are actualized in final products, as well as in an individual's choices or in organizational procedures. Eventually, in design processes, values are embedded in technology. Consequently, technology cannot be free from values. Previous notions constitute the relevance of this research. This chapter introduces the disciplines that are, in the context of this study, relevant in examination of HTI design values.

3.1   ICT-Ethics

The traditional techno-centric conception of technology, particularly ICTs leaves users' needs as social factors, not to mention leaving ethical issues largely unexplored (Orlikowski & Iacono, 2001; Finkelstein & Hafner, 2002; Alter, 2003). This shapes the expectations of practitioners in the technology industry about professional ethical practice. In contrast, an expanded conceptualization of technology that brings other issues into focus, must be stressed. One important aspect of ICT-ethics is integrating technology and human values in such a way that technology advances and protects human values rather than damaging them. Only through carefully considered and transparent actions in HTI design is this possible.

Traditional research concerning the ethical issues of ICT is based on Wieners' work in the 1940-50s. According to him, ICT-ethics apply to technology's

real and possible consequences through human values, such as health, happiness, life, peace, and justice (Wiener, 1948; 1954). The role of ICTs is therefore to develop and defend human values by means of ICTs' influence. Wiener's view has been criticized for being too universal and unattached to practical life (Bynum & Rogerson, 2004). Later, in the 1960s, the domains of ICT ethics started to expand with Parker's research of unethical and illicit uses of computers. As a result of his studies, the Association for Computer Machinery (ACM) developed a professional codes of ethics (Bynum & Rogerson, 2004). Maner introduced the concept 'computer ethics' in the 1970s. In his definition, computer ethics is a branch of philosophy, with scope on ethical problems caused by computers. Maner's definition leans on philosophical theories, like utilitarian theory of ethics. His conception has been criticized for conversing on ethical problems caused by computers, only in affiliation to information and communication technologies (Bynum & Rogerson, 2004). However, there are several definitions of ICT-ethics. Few most prominent has been summarized to the TABLE 1.

TABLE 1   Definitions of ICT-ethics

Definitions of ICT-Ethics	
Johnson	Computer ethics is the analysis of the nature and social impact of computer technology and the corresponding formulation and justification of policies for the ethical use of such technologies. (Johnson, 2004).
Bynum	"To integrate computing technology and human values in such a way that the technology advances and protects human values, rather than doing damage to them." "…computer ethics identifies and analyses the impacts of information technology on such social and human values as health, wealth, work, opportunity, freedom, democracy, knowledge, privacy, security, self-fulfillment, etc.'"(Bynum, 1999, 17).
Moor	"A central task of computer ethics is to determine what we should do in such cases, that is, formulate policies to guide our actions….One difficulty is that along with a policy vacuum there is often a conceptual vacuum. Although a problem in computer ethics may seem clear initially, a little reflection reveals a conceptual muddle. What is needed in such cases is an analysis that provides a coherent conceptual framework within which to formulate a policy for action."(Moor, 1985, 266)
Gotterbarn	"There is little attention paid to the domain of professional ethics—the values that guide the day-to-day activities of computing professionals. By computing professional I mean everyone involved in the design and development of computer artifacts.…The ethical decisions made during the development of these artifacts have a direct relationship to many of the issues discussed under the broader concept of computer ethics." (Gotterbarn, 1991, 26).

The discipline of ICT-ethics constitutes the majority of the conceptual foundation for discussion of aspects of values in HTI design. Technology is not only about the selection of devices and services, but also a process wherein numerous motives, objectives, devices, and consequences of these goods are involved. Therefore, all technological development has profound influences. Frantic technological changes may shake social structures and relationships, many technical solutions has harmful side effects to the environment, some technical solutions may cause risks for users, and so on. In evaluations of the relationships between technology and society, or technology and the individual, several viewpoints stand out, such as following notions:

1. Technology from the users' perspective. Ethical issues such as respect for rights, autonomy, dignity, integrity, right to decline, informed consent, trust, competence, democracy, participation, protection of user, safety, access, freedom of choice, voluntariness, and privacy are relevant.

2. Technology from the developers' perspective. Ethical issues such as reliability, surveillance, respect for intellectual property, comprehension, accountability, and competence are relevant.

3. Technology from society's perspective. Ethical issues such as equal benefits, cooperation, freedom from bias, conventions, cultural diversity, the social impact of technology, and its role in society are relevant.

Technology is easily perceived as exact and fact-orientated, free from ethical questions that in turn are related to imprecise issues. However, this mindset is declining because all technological application incorporates ethical aspects (e.g., Stahl, 2008). Since ICT technology partially constitutes the things to which it is applied, it has become a constitutive technology (van den Hoven, 2005) that shapes human actions, conventions, practices, and institutions in substantial ways. It affects the ways individuals experience themselves and others. In addition, education, politics, science, health care and public administration will be, at least to some extent, determined by the ICT application that will be chosen. ICT usage also leads to various risks. For example, ethical discussions have been begun about respect to privacy, security, data protection, and confidentiality, among others (TABLE 2).

TABLE 2   Topics of ICT-ethics

ICT-ETHICS

Commerce	Social Justice Issues	Computer Abuse	Intellectual Property	Speech Issues	Privacy	Risks	Basics
Fraud	Downsides of Computing Age	Hacking	Software Piracy	Chain Letters	Database Privacy	Software Safety	Principles
Taxation	Workplace Issues	Worm, Viruses etc.	Patent and Copyright Law	Free Speech	Encryption	Network Security	Codes of Ethics
Free Trade	Equity of Access		Electronic Copyright	E-mail Privacy	Privacy on the Web	Artificial Intelligence	
Gambling				Netiquette	Spamming	Licensing	
Anticompetitive Practices				Anonymity		Software Reliability	
						Computer Models	

The totality of HTI design, as a process, for example, in designing a singular application in an industrial setting, can be seen as multiple networks in which individuals are definitive actors transforming, producing, and maintaining knowledge depending on their position in the organization and personal propensities and skills. Consequently, the discipline of technology design has been divided into numerous domains of proficiency depending on the content of tasks and definitions of positions in the organization. The capacity of processing knowhow for creating products is the common factor of these domains. In an organizational environment, professional ethics constitute codes of conduct or desirable actions. Actors in HTI professions carry additional moral responsibilities toward society because they are capable of acting and making decisions about the issues that public cannot (Whitbeck 1998).

In the beginning of the 1990s, Gotterbarn advocated a different emphasis within ICT ethics. According to his view, ICT ethics should be seen as *professional ethics* devoted to the development of codes of conduct and standards of good practice for ICT professionals. Gotterbarn stated in the article *Computer Ethics: Responsibility Regained*:

> There is little attention paid to the domain of professional ethics—the values that guide the day-to-day activities of computing professionals in their role as professionals. By computing professional I mean anyone involved in the design and development of computer artifacts....The ethical decisions made during the development of these artifacts have a direct relationship to many of the issues discussed under the broader concept of computer ethics (Gotterbarn, 1991, 26).

With previous aspects of ICT ethics in mind, Gotterbarn worked with other professional ethics devotees, such as Martin and Rogerson, to advance professional responsibility among computer practitioners during the 1990s. Before 1991, Gotterbarn had been part of ACM's committee to create the third version of the organization's *Code of Ethics and Professional Conduct*, adopted by the ACM in 1992 (Anderson, Johnson, Gotterbarn & Perrolle, 1993). Later, ACM and the Computer Society of the Institute of Electrical and Electronic Engineers (IEEE) developed licensing standards for software engineers. Gotterbarn also headed a joint team of IEEE and ACM to create the *Software Engineering Code of Ethics and Professional Practice*, adopted by those organizations in 1999 (Gotterbarn, Miller & Rogerson, 1997). The Accreditation Board for Engineering Technologies (ABET) has long required an ethics component in the computer engineering curriculum. In 1991, the Computer Sciences Accreditation Commission/Computer Sciences Accreditation Board (CSAC/CSAB) also required that a significant component of computer ethics be included in any nationally accredited computer sciences degree-granting program (Conry, 1992). Generally, professional organizations in computer science recognise and insist upon standards of professional responsibility for their members.

3.2   Values Embedded in Technology

Ethical questions related to technology have typically only concerned human conduct. However, the notion that technology is not morally neutral (Nissenbaum, 1998; Brey, 2000; Johnson, 2006; Flanagan, Howe & Nissenbaum, 2008) provides the reason for exploring HTI values. The *embedded values* approach, formulated by Nissenbaum, holds that computer systems and software are not morally neutral and it is possible to identify tendencies in them to promote particular moral values and norms; computer programs can, for example, support privacy or mitigate against it (Nissenbaum, 1998; Flanagan et al., 2008). Such tendencies in computer systems can be understood as 'embedded' or 'built-in' moral values and norms in the sense that they can be identified and examined independently of actual use of the system. The objective of the embedded values approach is to identify such tendencies and morally evaluate them. The approach does not claim that information systems engage in moral actions, or that they bear moral responsibility (Johnson, 2006). Rather, it claims that the design and operation of systems have moral consequences and should therefore be subjected to ethical analysis.

What does it means for an artifact to have embedded values? Friedman and Nissenbaum presented a paper in which they scrutinized the *bias* in computer systems (Friedman & Nissenbaum, 1996). This document can be seen as the beginning of the study of embedded values in ICT. By definition, a biased computer system unfairly and systematically discriminates against certain users of the system, groups, individuals, or other stakeholders. An example of such bias is loan approval software that makes discriminatory recommendations

about individuals with ethnic surnames. Different types of biases can be distinguished. *User biases* discriminate against systems' users, and *information biases* discriminate for stakeholders the system represents (Brey, 1998). There are also various kinds of information bias such as bias in categorization, data selection, search algorithms, and information contents.

Friedman's and Nissenbaum's analysis of biases in computer systems can be extended to concern values in general. Biases can have three origins. *Preexisting biases* originate from attitudes and values existing prior to design of a particular system. Resulting from the values of designers or others who have significant input into the design, they can be *individual* or *societal*, arising from organizations or the surrounding culture that constitutes the context for system development. However, preexisting biases can be embedded in systems intentionally by individuals or institutions or unintentionally (Friedman & Nissenbaum, 1996). *Technical bias* arises from technical considerations. Technical considerations may not be value-laden in their essence, but could result in value-laden designs. For example, solutions made concerning techniques in software design may not allow sufficient security, leading to failures in privacy. *Emergent bias* occurs when the social context in which the system is used is not the one the designers intended. In an inadequate context, the system might not properly support the interests or capabilities of users.

Biases are only group of issues in discussions about how technology embodies values. Within the embedded values approach, studies have focused also on specific technologies and specific values like privacy, moral accountability, and trust. After examining bias in computer systems, Friedman and Nissenbaum considered the consequences of software agents, for example related to the programs that perform tasks on behalf of a user, for the users' autonomy. According to their argument, software agents can reduce users' autonomy in several ways, such as limiting the relevant information available. Therefore, it is important to design the software agents that enhance users' autonomy (Friedman & Nissenbaum, 1997). Another examples of studies are Johnson's (1997) study about the democratic tendencies of the Internet that can be limited if subjected to filtering systems that only grant control over information flow to a very limited group of individuals. Brey (1999, 2008) studied values in computer games and simulations and in virtual reality applications. Tavani (1999) has analysed the implications of data mining techniques for privacy, and Fleischmann (2007) discussed values that are embedded in digital libraries. Previous examples investigated technology's capacity to promote and impede values, and the previous classification of biases (Friedman & Nissenbaum 1996) can be extended to embedded values generally. They can be preexisting, technical, or emergent. However, classification indicates that values that are embedded in technology do not necessarily reflect the values of designers. Embedded values usually are not intentional, but embedding can be intentional. When designers are aware of how values are embedded into products, and if designers anticipate the future uses of the product, it is possible to design products intentionally to promote particular values.

The basic argument behind this study is based on the notion that in HTI design, values are embedded in the final product. Consequently, technology is not free from values. To prevent biases, values must be scrutinized, but simply recognising values is not enough. The mental contents and individual differences in these contents must be also recognised to obtain conceptual consensus in practical contexts in which design decisions are made.

3.3 Definitions and Basic Attributes of Values

In relationship to professional ethics, values are rules by which the individual designer make decisions about right and wrong. Values help us perceive which values are more or less important, or which is useful when one have to choose one value over another. They can also be described as culturally shared conceptions of what is desirable, they play a central role in directing actions, and are considered according to their relative importance (Schwartz & Bilsky, 1987). Among other extents of values, ethical values hold special characteristics. They should regulate the order and manifestation of other values. Although there is a lack of consensus about the constitution of values, most theorists agree that values are standards or criteria (Kluckhohn, 1951/1954; Rokeach, 1973; Kilmann, 1981; Schwartz & Bilsky, 1987) for choosing goals or actions and are relatively stable over time (Kluckhohn, 1951/1954; England, 1967; Rokeach, 1973). It is commonly proposed that values develop through the influences of culture, society, and personality.

Values have been studied in many disciplines. In the social sciences, Kluckhohn and Rokeach are prominent developers of conceptual and empirical foundations of value studies. Later, Schwartz continued their work along with Bilsky. Their definitions of values are convergent, since they have leaned largely toward each others' views. TABLE 3 below presents a few basic definitions of values.

TABLE 3   Definitions of values

Kluckhohn	-	Value is an explicit or implicit conception or characteristic of individual or group of what is desirable.
	-	Affects choices of available actions and objectives.
	-	Variation in values depends on whether they are values of individuals or groups.
	-	Separation from desires and wants (Kluckhohn, 1951/1954).
Rokeach	-	Value is a stable belief that a certain procedure or objective is personally or socially better compared to some other procedure or objective, i.e., values are beliefs defining desirable procedures and objectives.
	-	Distribution of instrumental values and terminal values. Instrumental values are means in actualization of terminal values.
	-	Amount of individuals' values is relatively small. Everybody shares the same values to different degrees (Rokeach, 1973).
Schwartz	-	Values are desirable objectives and guiding principles of actions, differing from each others in considered importance.
	-	Non-situation limited goals (terminal and instrumental) expressing different interests (individual or collective).
	-	Values can be evaluated as extremely important to not-important principles guiding individuals' lives (Schwartz, 1992, also Schwartz & Bilsky, 1987; Schwartz & Huismans, 1995).
Rescher	-	If an individual N stands up for value X, there is reason to expect N to adapt in a reasonable sense to what is a characteristic manifestation of X in speech and action (Rescher, 1969).

Besides basic definitions of values, some conceptual distinctions should be made. Theorists argue for the importance of research values as opposed to attitudes. Attitudes are attached to specific objects, whereas a value does not correspond to a particular object or situation. Additionally, values are standards, unlike attitudes. Furthermore, individual have fewer values than attitudes, making values more economical constructs (Rokeach, 1968). Compared to attitudes, values occupy a more central position in individuals' cognitive systems, determining attitudes and being closely related to motivation. Notwithstanding the debate concerning these distinction, attitudes research can be applied to values; both can be measured on a continuum from general to specific, with values being more general than attitudes and not corresponding to a particular situation. Values are abstract in nature and therefore perceived somewhat similarly as attitudes, through which values can be examined (e.g., Eagly & Chaiken, 1993; Stahlberg & Frey, 1996). For example, in Rokeach's view, value differs from attitude by being a more universal, foundational, and abstract concept (Rokeach, 1973, 1979). Like attitudes, values are learned through direct experience or through influence processes (Fazio & Zanna, 1981). The more knowledge or experience a individual holds about the object of the value (or attitude), the stronger it is.

Another important distinction should be made between values and norms. According to Allardt (1985), norms are the means for making choices that certain values require. Also, the distinction between values and needs should be recognised. The concept 'need' can be perceived as a psychological or biological sub-concept of the concept 'value' (von Wright, 1989). In all, relationships between norms, attitudes, and values are complex. When interpreting value studies, it may be difficult to separate values as modes of behaviour, such as achievement, from values as outcomes, such as association of achievement associated with a particular profession. However, values are distinctively characterized by *oughtness* (Kluckhohn, 1951/1954), which indicates that values specify an individual's beliefs about how one should behave. Although not completely explicitly recognised, the theoretical distinction of whether values are merely preferences or have an aspect of what *should* be preferred is unclear. The complexity concerns whether the *ought-should* element relates only on moral values (Kluckhohn, 1951/1954; Scott, 1965; Kilman, 1981) or to socially determined values as well (Rokeach, 1968; Locke, 1976; Schein, 1985). Therefore, values do not straightforwardly reflect how one wants to behave, but rather reflect one's internalized interpretations about socially desirable ways to fulfill one's needs (Kluckhohn, 1951/1954; Rokeach, 1973; Williams, 1979). The latter distinction indicates that values are (partially) influenced by culture. There is also a social dimension of values that becomes visible in an individual's experience of guilt when he or she acts inconsistently with social expectations that he or she endorses (Kluckhohn, 1951/1954). According to these views, values can be defined as an individual's internalized interpretations of how he or she should behave.

Once internalized, a value system functions in several ways, affecting an individual's perceptual processes in the manner that external stimuli are perceived in ways that are in consistency with that individual's value structure (Postman, Bruner & McGinnies, 1948; Williams, 1979). Values also serve legitimizing operations, providing justifications for an individual's behaviour (Williams, 1979; Nord, Brief, Atieh & Doherty, 1988), and directly affecting behaviour, encouraging individuals to act in accordance with their values (e.g., Rokeach, 1973; Williams, 1979). In this sense, values have significant role in affecting individuals' behaviour (Rokeach, 1973). Besides other constructs that are essential in understanding human behaviour, values affect general modes of behaviour across situations and over time (Epstein, 1979). The psychological mechanisms responsible for values' effects on behaviour depend partly on whether the behaviour is public or private. Since values designate socially desirable modes of conduct, the threat of social sanctions such as shame induce individuals to conform to dominant social values in their public actions (Kluckhohn, 1951/1954). Individuals' internalized values function as personal standards of conduct. As in public behaviour, these values also may trigger, for example, feeling guilt or self-depreciation about inconsistent private actions (Kluckhohn, 1951/1954). Consequently, value-related behaviour is practiced in private to avoid negative internal feelings.

When assessing the relationship between values and behaviour, values that are *in use* must be distinguished from those that are *espoused* (Argyris & Schön, 1978). Because of the socially desirable aspect of values, there are pressures to express and validate values publicly regardless of whether they are held internally (in use). Therefore, when an individual's values differ from those that are prevalent in his or hers social environment, for example, in the organization where he or she works, the values of the social environment might influence to what the individual says, but may not predict how that individual will actually behave.

3.3.1 Organizational Values

Values occupy a prominent place in both scientific and public discourse at several levels. For instance, values have a significant effect on individuals' affective and behavioural responses (e.g., Rokeach, 1973; Locke, 1976), on intended increases in unethical business practices (e.g., Mitchell & Scott, 1990), and on employees' problems in organizations (e.g., Nord, Brief, Atieh & Doherty, 1988). At the organizational level, values are usually described as principles that are responsible for successful management (e.g., Mitchell & O'Neal, 1994). Generally, values are viewed as a salient component of organizational culture (Schein, 1985; O'Reilly & Chatman, 1996). Despite of the popularity of values as object of research, however, there is not a clear consensus on the nature of values. They have been conceived as motivations, goals, attitudes, personality types, interests, needs, and mental entities. The absence of agreement (e.g., Kluckhohn, 1951/1954; Williams, 1979; Rokeach & Ball-Rokeach, 1989) has lead to difficulties in interpreting the results of studies, and steers the need for greater agreement on how values are defined, conceptualized, and measured, especially in organizational research (Connor & Becker, 1979, 1994).

As in individuals lives, values are a major element of an organization's culture (O'Reilly & Chatman, 1996). Organizations do not possess values that are separate from the values of that organization's members. Therefore, when examining organizational values, the key issue is to avoid measuring just espoused values (Argyris & Schön, 1978) that are not really integrated into the behavioural practices of the organizations' members. However, the role of values within an organization is similar to their function in society as a whole. According to Schein's (1985) description, they function as *external adaptation* and *internal integration*; just as values specify the behaviours appropriate for satisfying individuals, an organization's culture specifies the behaviours that are necessary for the organization to survive (external adaptation). Since shared values enhance interactions between individuals, the organization's culture encourages interactions between individuals (internal integration). Nonetheless, value congruence between the members of an organization does not necessarily enhance performance of certain tasks. For example, in tasks that require decision-making, judgment and creativity, homogeneity among the group created by similar values may even inhibit performance (Goodman et al., 1986).

3.3.2 Work Values

The conceptions of work values vary, as do the ways in which they should be classified. There is no commonly accepted definition of work values (e.g., Zytowski, 1970; Pryor, 1981), in the sense that definition would include conceptualizations that are relevant to the construct and that would distinguish work values from other constructs. Nevertheless, compared to personal values, work values can be thought to hold stronger social consensus. In contrast to personal values, which are grounded on or chosen mainly due to personal experience, social consensus values are more often absorbed due to the influence of others (Fazio & Zanna, 1981). In the literature concerning work values, discussion is largely focused on the social construction of values (England, 1967; Bandura, 1977; Payne, 1980; Hofstede, 1984; Schein, 1985; Jones, 1991). Shared understanding is key in determining what is valued (e.g., Scott, 1965). Work values have also been studied as derived from needs (e.g., Super, 1973) or as preferences (e.g., Pryor, 1979). The interest in work values has increased on both practical and conceptual levels (e.g., Judge & Bretz, 1992). Altogether, research of work values has been driven by the concern about employees' motivation (Brown, 1976), and also because concern over the ethical values has been distinctive (Payne, 1980; Saul, 1981). Because of the lack of consensus regarding definitions and conceptualizations of work values, the research seems fragmented.

In this study, the term 'value' is used to refer to values generally that can be hold by individuals, organizations, or some other instance. The focus is, however, on the individual's values in the context of HTI design. Regardless, in this study, since the interest is on mental contents of values that are conceived as mental representations, it is not relevant to focus on problems in distinguishing work values from personal values.

3.4 Values in Human-Technology Interaction Design

In human-technology interaction design, decision-making is a combination of the use of knowledge, skills, and values. Values have an essential role in such processes, since they direct many of the decisions designers make, including the way in which their design activities are organized cognitively. The values present in professional actions can roughly be divided into internal and external values, i.e., values that the individual has internalized as part of his or her own value system and values that are socially espoused within the organization. In making value judgments in their work, it is reasonable to suppose that designers use perceptions of external values that are presented, for example, on behalf of an organization. There are several possibilities to categorize values, such as Hicks' categorization of values acting on the decision-making process (Hicks et al., 1982), which include the categories of technical, economic, aesthetic and moral values. However, literature related to the external value

categories from which perceptions are made appears relevant because designers are representing societal, economic, and recognised stakeholders' values.

The comprehension of values influencing in designer's decision-making spanning from research conducted in the 1970s (e.g., Rokeach, 1973; Gregory & Commander, 1979). Designers' decisions are affected by personal values, interests, taste, preferences, and previous experiences. These personal values are considered abstract values, describing value judgments at a more abstract level than, for example, judgments regarding the physical form or materials of the product. In such abstract judgments, one must consider to what extent each phase toward the objective satisfies the overall need. Personal values also seem to have internal organizational and hierarchical systems that in addition to value organization and relations between each others, thinking behind the actions directs both on backwards, and as reflective practice, also looks forwards for aiming to plan ahead (Schon & Wiggins, 1992). The use of personal value organization is involved in processes in which judgments about how intentions are realized shape the activity (Layton, 1992). Designers' use of values can also be understood as ordering mechanisms (Daley, 1982/1984), and as principles for evaluating and determining potential consequences. Evidently, designers must make value judgments as to what extent a particular idea serves the overall objective, and what kinds of alternatives should be investigated.

External values are derived from society. The literature shows several examples of societal values, for example, Hicks et al ' (1982), and Layton's (1992) contributions, both of whom discuss the relationship between society and the man-made world. Design decisions are influenced by the values of the society for which they are intended. Hicks (1982) emphasises the importance of ethical values in carrying out design activities and evaluating the effects of technology, whereas in Layton's (1992) view, technology bears social imprints and shapes society. According to Layton, design preserves social hierarchies and social values that allow technological adoption or technological obsolescence. However, design reflects cultures. Green (2003) addresses that design must be socially and culturally acceptable. Needs are experienced within cultures, and therefore social values determine how the products are viewed (Boztepe, 2005). Baynes (2004) emphasises the social worth of products and designers' responsibility to address socially significant problems. Altogether, values are embedded in a social context.

The issues of values related to economics are well reflected in research literature. Overall, the relationship between an object of design and the economic gain that can be obtained is discussed by authors such as Baynes (2004), who stresses understanding the relationship between economics and the political and environmental power of consumption, as well as the aspiration to seek a fit between profit, needs, and wants. In writings by authors like Layton (1992), on the other hand, the notion that designers' internal values are embedded in design is stressed; technology cannot be value-free but instead reflect values that may be societal, cultural, economic, and so on. According to Jordan and McDonald (1998), designers need to understand the additional value product

holds, including the physio-pleasure, socio-pleasure, psycho-pleasure, and ideo-pleasure. In addition, designers need to understand product semantics. Nonetheless, values that are finally embedded in products are inherent and enhanced by subjective judgments (Sassatelli, 2000). Previous brief view to literature provides evidence for the view that values are embedded in existing products, and that products can also be used to inform subsequent design operations. It also seems in light of previous views that designers involved in decision-making embed certain values within their design decisions that increase or decrease the product's embedded value.

3.4.1   HTI and Ethical Design

Ethical design includes the idea of conscious reflection and selection of ethical principles when one is considering different design options. Furthermore, ethical design indicates the actualization of ethics in the design process, from the starting point that includes the use of ethically acceptable design methods. In addition, ethical design refers to the reflection of what ethicalness and human good eventually are. From this perspective, ethical product and service development should aim at the actualization of human good: The purpose of certain product or service should further this and should not cause harm.

Ethical design is usually attached to Human-Computer Interaction tradition, in which user-centred design is emphasised in ICT development (Preece Preece, Rogers, Sharp, Benyon, Holland & Carey, 1994; Helander, Landauer & Prabhu, 1997; Shneiderman, 1998; Carroll, 2003; Jacko & Sears, 2003). In the 1970s, HCI research was still a strongly technically and system driven approach, but in the 1980s, a user-centred view become more prominent and led to standardization of user-centred design (ISO 1998; ISO 1999; ISO 2000). In the 1990s, context-aware approaches predominated in HCI. Later value-centred views appeared in HCI. Generally, 'value-centred' refers to the relationship of HCI and human values (Friedman & Kahn, 2003; Cockton, 2004; Cockton, 2005; Friedman, Kahn & Borning, 2006). In HCI, the emphasis has been on user's appreciations, expectations, and values. One of the most encouraging approach for HCI is a worth-centred approach introduced by Cockton (2004, 2005, 2006, 2008). Within worth-centred development (WCD), the emphasis of design is in its interaction outcomes, indicating *worths* that people consider in relationship to products. When worths are conceived values, they cover broader contents than, for example, the moral values of justice, freedom, privacy, or welfare. According to Cockton, design decisions are based on practical or intended value that users experience. Naturally, in addition to just practical values, there is also other worths, such as emotional worth, that can be experienced for example when playing a game.

WCD should be separated from value-sensitive design, which emphasises moral values. According to WCD, users' values should be considered independently from moral imperatives in design, whether values are moral or nonmoral. Design should focused on things that are 'worthwhile' for the user, from an individual or collective perspective, regardless of ethical norms, trends, or

other people's approval. Compared to morally oriented value-sensitive design, WCD's relationship to 'value' is more practical. WCD concentrates on the worthwhile, meaning "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, 168). As a word, worth indicates people's motivations, specifically their needs and wants, as well as product motivators such as quality. Notwithstanding the practical emphasis of 'worths', they can also be ethical. However, the basic idea of 'worth' is not unique. Similarly to Cockton (2006), Sponselee, Schouten & Bouwhuis (2008) assume that personal needs determine the added value of technology and its usefulness. Consequently, by designing technology based on values and the need to satisfy these values, the usefulness of technology should increase, increasing also technology usage as a result (Sponselee et al, 2008).

Instead of being a fixed methodology for design, WCD starts by connecting people and design sketches, worth maps that describe the relationship between human values and different design possibilities (Cockton, 2008). In WCD, six principles direct the design process. First, *commitment* obliges the designer to include particular values in the design outcome. Through *receptiveness*, the designer is sensitive in understanding users' values, making them concrete, and seeking support for them from user studies. *Expressiveness* places these values in the design with the help of worth maps. *Inclusiveness* stresses the importance of all stakeholder groups participating in discussions concerning essential design outcomes and user experience. The principle of *credibility* states that design decisions should be justified, realistic, and feasible. The last principle, *improvability*, stresses the importance of adaptability and measurement; if user-interface interaction does not work, it is possible to re-examine it to search for alternative design elements.

In Cockton's view, perceiving worth requires investigation of discourses, wherein all human value is created (Cockton, 2006). Such discourses can focus on the individual or the collective. In many cases, for collective discourse, there is corresponding individual discourse, for example, culture-identity, community-belonging, society-esteem (Cockton, 2006). This notion opens up interesting possibilities to scrutinize 'worths' both from individual and collective perspectives. When individual worth is a baseline of design, WCD emphasises *volition* in interaction design, in which case users' motivation is a starting point of design instead of users' goals or objects. According to Cockton (2006), goals and objects in human-technology interaction examination and development are goals and objects relevant to collective worth, instead of being grounded in individual motivation. Collective worth can be, for example, political worth for the public sector, or economical worth to companies. In WCD, human motivation plays an important role when one is considering people's wants, needs, and values or worths. The product's quality as such is intrinsically its ability to respond to users' wants and needs in worth-centred thinking. Good quality can increase worth, just as poor quality can reduce worth. Therefore, quality should be regarded at best as a surrogate for such wants and needs. At worst, according to Cockton (2006), individual product qualities may become beliefs that al-

ienate human motivators from product attributes if they are mistakenly attributed with intrinsic qualities of universal value. "There are no people in such accounts of product quality" (Cockton, 2006, 169).

Briefly, WCD is an example of an approach to design wherein values as worths are actively incorporated into design decision processes. Worths cover broader contents than just moral values. However, when one considers worths and their contents to different user groups, specifically the most vulnerable ones, incorporating ethical principles in the discussion is crucial. Underprivileged groups of people, for example children or elderly people, obviously are more vulnerable than target groups of commercial products. Thus, ethical values must to be implemented in design to make products acceptable for such groups (Rauhala, 2007). Although the notion of worth is a practical concept in the development of technological solutions for peoples' needs and wants, within the approach it is not clear on what grounds such wants and needs are defined acceptable objectives to be implemented in products, or on what grounds relevant 'worths' are assessed.

If the design principles of WCD are considered intuitively from the content-based reference frame, it remains unclear what the 'worths' of developed products are related to wants and needs in a scientifically grounded manner. WCD introduces the added value of the product to the user, but does not offer a conceptual understanding of what constitutes such values or 'worths'. If 'worths' are considered as values purely by concentrating on naming particular values, the realities in different use contexts may be missed if the focus is on fulfilling users' values. Different conditions in use contexts create opportunities and limits for the use of technology, which may have nothing to do with values, when worths are simply named as particular values without analysing their meanings through conceptual contents, but they still play a significant role in the adoption of technology. Therefore, for the analyses of processes wherein the meanings are given and interpretations are made, a content-based reference frame seems to be applicable in the context of WCD. Since values may be constituted of several types of conceptual elements with various associations, if one concentrates only on values as concepts, the essential elements attached may remain unrevealed.

Another notion related to WCD is that if the design is focused only on satisfying users' needs, wants, and values, the composition may be unsustainable in the long run without including ethical considerations in the design. It should also be considered which of the users' needs and wants are really worth implementing. There is always a risk that design decisions ultimately hark back only to the economical interests of business organizations' shareholders, to the detriment of enhancing sustainability, for instance. Another risk is that in utilizing WCD, product development is directed by the ideology of technological determinism. Technological determinism presumes that a society's technology drives the development of its social structure and cultural values and that the development of technology itself follows a predictable, traceable path that is mostly beyond cultural or political influence (e.g., Smith & Marx, 1994; Miller, 1997). According to this view, technol-

ogy in turn affects societies in ways that are inherent rather than socially conditioned or produced, since society organizes itself to support and further develop a technology once it has been introduced.

The challenging objective for ethical design is to develop a humanistic research routine and design that take the best from areas of HCI-design. This kind of routine would need to account for the range of human values beyond usability, predicated by the need for moral responsibility in implementing new technologies. In this sense, ethical design must be human-centred, quantitative, qualitative, and multidisciplinary. TABLE 4 below presents examples of ethical theories and their correspondences in HCI that should be taken into account in the product development processes to promote more sustainable solutions. The moral responsibility of design has led toward an ethical design approach that attempts to promote good through the creation of products made and consumed within a socially accepted moral framework.

TABLE 4   Examples of ethical theories and their correspondences in HCI (based on Caims & Thimbleby 2003; modified by Leikas, 2009, 52)

Ethics	HCI
Deontology - Value is in the activity, not in the consequences. - Universal norms defined by normative ethics.	Sustains standards, norms, and values..
Situation Ethics (particularism) - Subject's morality depends on its context. - Adoption of ethical principles through considering the relationship between the subject and its context.	Depends on user's motivation, wants, needs, and assignment.
Ethical Monism - Certain values and norms are principal compared to others.	Focus on design usability.
Utilitarism - Best solution is the one that produces the greatest amount of happiness to the greatest amount of people.	Cost-efficiency of design. Principles of business ethics are right because they best guarantee succeeding.
Consequentialism - Desirable act is based on the consequences of its accomplishment compared to the outcomes of other alternative actions.	Usability metrics, usability measurement.
Virtue Ethics - Constituent functions. - Reasonableness.	The designer is right.
Hedonism - Pleasure and enjoyment.	Focus on contributing to users' enjoyment.

Typically, ethics is comprehended just as professional ethics. For HCI, if comprehended narrowly, this means just providing a general framework to define practices that are limited to legal liabilities by applying deontological principles. However, the objective of HCI is to make the user's experience good. When considered further, the parallels between ethics and HCI seem prominent. The relationship between ethics and HCI is challenging, though, because applying ethics constructively raises relevant issues in HCI to which actors in design may make commitments to establish the ethical framework (Caims & Thimbleby, 2003).

At the core of ethical design problems is a lack of communicating conflicting users', and other stakeholders', needs. Therefore, in design processes, communication with a wide range of people is needed, and design methods need to speak not just to users but also to the engineers who build systems. Design teams need to accommodate different viewpoints and share a common language that can convey technical as well as ethical data. Ethical design requires more than just reflecting on users' existing needs or wants, as is done in WCD. People often do not know what options are available, users' needs and wants may be inaccessible to the design team, or users may not be able to explicate them. Therefore, design teams need to see beyond requirements and consider underlying needs and potential ethical issues. However, the foundation of ethical dimensions has changed over the years, and the focus has shifted from such concerns as the makers' virtue as evidenced through the objects' integrity and aesthetics to the role of designer and consumer in a just society.

3.4.2 Professional Ethics

According to the logic of market economy, the goal of business activities is to make a profit. It is not clear what organizations' relationships to values or ethics should be. From the human viewpoint, business activities are attached to the survival of the species; basic needs are satisfied by interacting with the environment, utilizing and refining resources, and sharing commodities. From nations' viewpoints, by means of business activities, the national benefits and well-being of the citizens can be secures. From individuals' viewpoints, economy is primarily ensuring one's own subsistence. Survival, security, power, well-being, enjoyment, and happiness can be seen as objectives of business activities, revealing the aspects of human values.

The issues of businesses objectives are more complex if examined from organizations' perspectives, the immediate objective of which is to make a profit. Entrepreneurship, however, is also rationalized based on arguments that along with economical growth, well-being is also produced. Thus, currency is seen as a n instrumental value in pursuing other benefits. Achieving socially desirable outcomes requires cooperation strategies that can be directed by legislation and soft methods, like moral norms, ethical codes, and interpersonal benevolence and trust. Also, the administrative practices that offer channels for people to influence things according to their values are soft methods. If an or-

ganization is recognised as a legal entity, it is also a moral subject holding ethical rights and responsibilities toward its stakeholders. Such responsibilities extend to considering the surrounding society and environment.

In business organizations, economic ideology and national culture impact individuals' values. When responsibilities in professional actions are emphasised, the actualization of values must be viewed in terms of ethics. Levinas defines ethics in terms of responsibility to *the Other* (Levinas, 1998; Critchley, 2002). This responsibility cannot be avoided because the encounter with the Other requires such responsibility, and therefore engages one as an ethical agent. If scrutinized from ICT designers' view, the designers' place in that relationship is not as an equal, but as a servant obligated by the responsibility to the Other. Such obligation can be considered responsiveness to the Other; thus, moral consciousness is seen not as an experience of values, but an access to exterior being (Critchley, 2002). Previous views describe ethics in terms of our relationship to others, rather than as a set of rules. According to Critchley (2002), this relationship is a foundation upon which ethical rules can be built. Regarding professional ethics, Koehn (1994) argues that the professional's promise to provide certain services on the client's behalf is the only defensible ground for professional ethics, since the promise forms a legitimate reason for clients to trust the professional. This promise is made implicitly when the professional accepts the role. It alone provides the basis upon which a client may trust a professional to conduct him- or herself in that client's best interest, supports any formal contract that may be entered into, and guides the application of the professional's expert knowledge.

Considering the current ICT environment, Denning and Dunham (2003) identified promise-keeping as a new wave, characteristic of the relationship between the ICT professional and customers, that is, in the new post-industrialized era, the driving force in business. The role of the professional is to satisfy the customer, and professionals distinguish themselves by establishing value-generating relationships, with 'value' defined by customer. In short, Levinas describes the basis on which to build ethical rules, Koehn secures the ground for ethics in the professions, and Denning and Dunham consider the reality of professional practice in the current Information Society. Their focus on the Other, whether client or customer, indicates the need for professionals to adopt a customer-centred attitude, which is imperative for professional practice to be ethical. Nonetheless, HTI design professionals have specialized knowledge and often positions within the community. Therefore, they can have an impact to the society, including many of the things that people consider valuable. Along with this kind of ability to impact society comes the obligation to exercise that power responsibly (Gotterbarn, 2001). These responsibilities emerge in a variety of professional relationships (Johnson, 1994): society-professional, professional-professional, client-professional, and employer-employee relationships. A diversity of interests, sometimes in conflict with each other, is involved within these relationships. Professional responsibility can, for

example, actualize in awareness of possible conflicts and in attempts to avoid them.

Professional organizations like the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronic Engineers (IEEE) have established curriculum guidelines and codes of ethics to help computer professionals understand their ethical responsibilities. ACM Code (1992) includes, for example, *general moral imperatives* such as 'contribute to society and human well-being', 'avoid harm to others', and 'be honest and trustworthy'. The code also includes *more specific professional responsibilities* like 'acquire and maintain professional competence' and 'improve public understanding of computing and its consequences'. The IEEE Code of Ethics (IEEE, 2006) includes directives such as 'avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist' and 'to treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin'.

Codes of ethics are controversial documents. Some writers have suggested that codes of professional ethics are pointless and unnecessary. Others believe that codes are useful and important, but disagree about why. At one end of the flock, Ladd (1991) argued that codes of ethics serve no good purpose. He contends that ethics should be open-ended and reflective, and that to rely on a code of ethics is to confuse ethics with law. He continues that it is wrong to assume that there are special ethics for professionals that are separate from the ethics of ordinary human beings within a moral society. Professionals have no special rights or duties apart from their rights and duties as moral persons, and therefore, codes of ethics are pointless and possibly pernicious (Ladd, 1991). A different sort of attack on the usefulness of codes of ethics comes from Luegenbiehl (1991), who acknowledges that codes of ethics do have some sociological value.

> The adoption of a code is significant for the professionalization of an occupational group, because it is one of the external hallmarks testifying to the claim that the group recognizes an obligation to society that transcends mere economic self-interest (Luegenbiehl, 1991, 138).

Lugenbiehl believes that ultimately, codes of ethics create moral problems rather than helping to resolve them. Practicing professionals rarely turn to their codes of ethics for guidance, and the guidelines within the codes sometimes seem internally inconsistent. He also has a concern similar to Ladd's: Implementing a code of ethics may conflict with the moral autonomy that is expected of individuals. In response, Harris, Pritchard & Rabins (1995) argue that all three of Luegenbiehl's criticisms can be surmounted. They suggest that though most practicing professionals do not routinely consult their codes of ethics, it does not follow that they do not know about or care about the contents of their codes. Furthermore, the fact that codes of ethics sometimes seem internally inconsistent can be addressed by understanding codes of ethics not as recipes for decision-making, but as expressions of ethical considerations to keep in mind.

Professional codes of ethics should therefore be considered ethical frameworks rather than specific solutions to problems. Finally, the authors argue that moral autonomy is not really compromised by codes of ethics (Harris et al., 1995).

Davis makes a strong positive case for professional codes of ethics, arguing that they should be understood as conventions between professionals. He suggests that having a code of ethics allows an engineer to resist pressure to produce substandard work not merely as an ordinary moral agent, but *as a professional* (Davis, 1991). Davis reasons that professionals should support their professions' code of ethics because, for example, it will help protect them and others from being injured by what other engineers do, and because supporting the codes will also help assure a working environment for engineers in which it will be easier to resist pressure to do much that the engineers would rather not do (Davis, 1991). Harris et al. (1995) summarize Unger's analysis of the possible functions of a code of ethics by recognizing that it can serve as a collective affirmation by members of a profession of its responsibilities, and can help create an environment in which ethical behaviour is the norm. Moreover, it can serve as a guide or reminder in specific situations, an educational tool that provides a focal point for discussion in professional meetings, and can indicate to others that the profession is seriously concerned with being responsible in professional conduct (Harris et al., 1995). A foundation of ethics requires values to which objectives and actions can be compared. In an organizational environment, a system of ethics and values that are actualized must be furthered by day-to-day choices that are made constantly. Considering the question of how the leaders of an organization can build an ethical climate, Andrews (1989) suggests a number of steps that foster corporate ethics, stressing, for example the importance of making explicit ethics policies (ethical codes) and the patterns of top leaders' behaviour in determining organizational values. However, establishing moral principles means identifying the core values that should guide the organization.

However, responsibility of professionals in ICT field is typically discussed in relation to a code of ethics that articulates specific responsibilities of HTI designers. As mentioned, such codes of ethics stress different types of responsibilities, such as conducting the profession with integrity and honesty and in demonstrating competence. The codes also embrace responsibilities towards employees and clients and a general responsibility toward the public and society. With respect to the latter, codes of ethics maintain that engineers should hold as paramount the safety, health and welfare of groups immediately concerned. However, one view exists in which codes of ethics as such are not morally binding but rather express moral responsibilities that are based on other considerations. One might, for example, base the responsibility of HTI designers on general philosophical notions of responsibility. For instance, they may feel compelled to act in a certain way due to hierarchical or market constraints, so that purely ethical considerations are not fulfilled. Negative consequences may be very hard or impossible to predict beforehand. Another inhibiting ele-

ment can lie in the long process from technological development to use, not to mention the many people involved in this process.

It might turn out that nobody is responsible for certain undesirable consequences of technology, even if the traditional philosophical notion of responsibility is applied to HTI design. This seems an undesirable result, not only because the social consequences of technology are frequently considerable, but also because negative consequences could have been prevented if certain precautions had been taken or if certain people had collaborated differently.

3.5   Measurement of Values

In value studies, most measures and manipulations of values leave a lot of space for varying interpretations. For instance, despite a history of diverse perspectives on values, social psychologists define them as abstract ideals that function as guiding principles in one's life (Kluckhohn, 1951/1954; Allport Vernon & Lindzey, 1960; Rokeach, 1968; Feather, 1975; Schwartz, 1992). People tend to consider ideals like freedom or equality highly important, both as intrinsically valuable ideals and prescriptive principles. This indicates that individuals are both intrinsically and externally driven to reach for such ideals. This result that in measurements of values that hold at least some importance to a majority of individuals.

The first renowned attempt to measure values was Allport et al.'s (1960) 'Study of Values'. The study proposed the existence of six value types, social, theoretical, economic, aesthetic, political and religious, which describe people's future activities. Allport et al.'s model and measure have been particularly useful for occupational psychologists to understand vocational choices (Kopelman, Rovenpor & Guan, 2003). Rokeach argued that the model is principally an evaluation of likes, dislikes, and attitudes toward occupations. He noted that values are more like idealized standards having an 'ought' feature. Based on asking participants to describe their values and an investigation of value-like trait words in English, Rokeach constructed a list of 36 values (Rokeach, 1973, 1979). He emphasised that relative differences in the importance of values are psychologically more meaningful than the importance of a particular value on its own. For instance, freedom is important, but what is more meaningful is whether freedom is more or less important than other values: A lower relative importance of freedom indicates more discriminative behaviour and attitudes, and vice versa (Rokeach, 1973). Therefore, participants were asked to rank values in order of their importance. However, a description of how diverse values are related to each other was not included in Allport-Vernon-Lindzey's model or Rokeach's theory. The issue is examined in the circular model of values that Schwartz (1992) presented.

3.5.1 Normative and Ipsative Methods

Within value researchers, there is division concerning the appropriate way to measure values. Some have used methods that measure values independently of each other (e.g., Wollack, Goodale, Wijting & Smith, 1971; England, 1975), and others have used methods that assess preferences between different values (e.g., Allport et al., 1960; Cable & Judge, 1996, 1997; Chatman, 1991). Cattell (1944) has used term *normative* to describe the former, and *ipsative* to describe the latter method. The ipsative technique asks respondents to choose one value or value statement in a *forced choice* format or to *rank order* a set of values, whereas the normative technique usually requires respondents to rate the extent to which they acknowledge a set of statements that describes a value or a set of values.

The asset of normative methods is that when values are rated independently, the absolute differences between values can be captured. If values are ranked, this would not be possible (Osgood & Suci, 1952). In addition, the normative method allows values to be rated as equal in strength, and also permits a respondent's value profile to be either high or low on any value. Researchers who prefer ipsative methods have pointed out that their method allows conceptualizing the nature of values themselves, since values are assumed not to be totally conscious (Locke, 1976; Rokeach, 1985). Ipsative techniques of measuring values require a respondent to make choices. Therefore ipsative scores are presumed to represent a respondent's true values rather than public endorsements of socially desirable statements. Additionally, according to adherents of ipsative methods, the method duplicates the way that values are cognitively held by individuals, i.e., hierarchically structured based on their relative importance.

Although several studies have compared the adequacy of ipsative and normative methods in examining values, there is no distinct resolution to the controversy. This conflict may be related to differences in the way that individuals process information under various circumstances. However, in real-life situations, there are situations wherein an individual's cognitive processes are focused on creating rank orderings, comparing alternatives to each other, and thereby constructing a hierarchy of alternatives (Rokeach & Ball-Rokeach, 1989). Through ipsative methods, information about a respondent's values in a choice situation can be captured, but it is impossible to assess through normative procedures. Then, there are situations when an individual's cognitive processes are focused primarily on making distinctions on independent dimensions. This might occur, for example, when one is concerned with classifying various entities or assessing whether an entity meets a particular standard; the terms indicating absolute intensity, extent, or degree, are typically used by individuals in describing entities as organizations, such as 'very', 'not at all', 'extremely'. In these cases, the information provided by normative scales seems reasonable, showing whether entity is placed low or high on any dimension, and the extent of differences between dimensions.

The measurement method that is used in the empirical value survey of this study is based on the normative measurement technique. Schwartz's Value Survey (SVS) was partly applied in the inquiry. The general objective was to explore the experienced importance of the set of values present in HTI design work. Normative scales were used since the scales contain information about the similarities and differences of values that is not contained in ipsative scales. These methodologies cannot capture information that values are constituted of, i.e., values as mental representations and their conceptual contents. The ipsative and normative scales tend to model different types of cognitive phenomenon. Individuals do not normally rate values related to a certain behaviour, nor do they rank order values describing different entities, so whether these response formats require cognitive processing that is appropriate within the study should be carefully considered.

3.5.2 Schwartz's Model

According to Schwartz's model, values are self-imposed criterions, helping individuals maintain a balancing act between basic motives. Values originate from one's needs as an individual and a member of social groups. In Schwartz's proposition, 56 values express these motives. Schwartz's Value Survey (SVS) followed Gorsuch's proposal in employing a quasi-unipolar rating scale that offers more rating points between differing levels of importance. In SVS (Schwartz's, 1992), participants are asked to rate values on a 9-point scale with labels at -1 (opposed to my values), 0 (not at all important), 3 (important), 6 (very important), and 7 (extremely important). The approach is supported by evidence that differentiation in ratings advances their prediction (Alwin & Krosnick, 1985; Krosnick & Alwin, 1988), and that rankings can force wrong distinctions (Maio, Roese, Seligman & Katz, 1996). Additionally, several studies have measured social desirability bias. The results indicate that bias poses less of a problem for methods than might be expected (e.g., Schwartz, Verkasalo, Antonovsky & Sagiv, 1997). Social desirability is partly controlled in measures that elicit high-value differentiation, since assessing values are relative to each other. Generally, the most essential feature in Schwartz's model (FIGURE 1) is the manner in which the values relate to others.
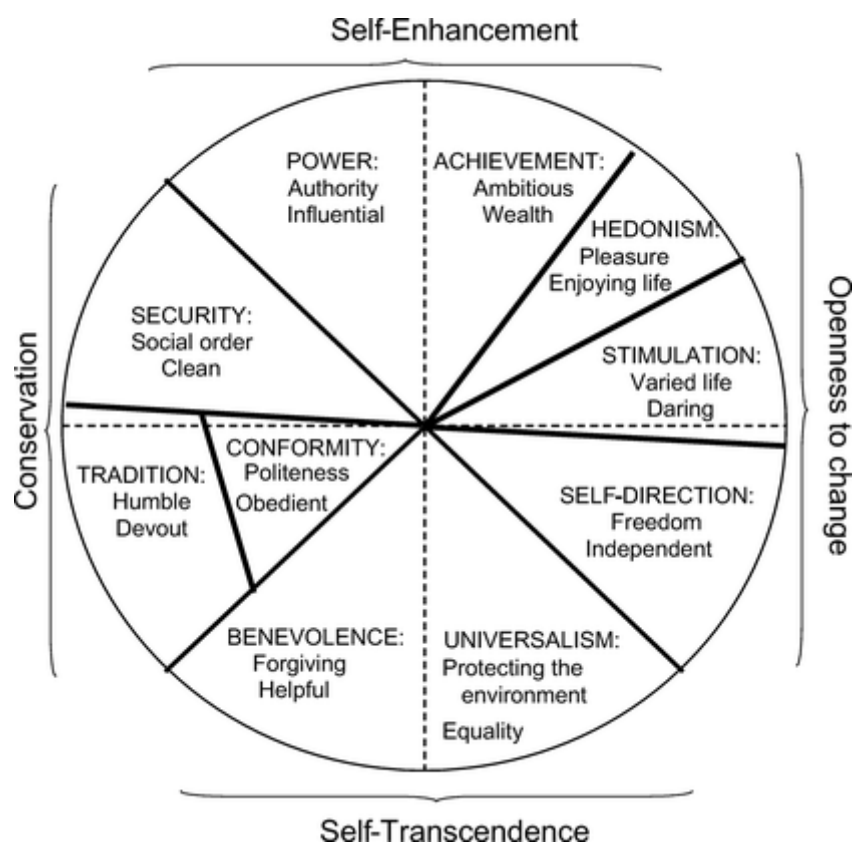
FIGURE 1   Schwartz's circular model of values

The values that are adjacent in the circumplex should tend to have similar correlations, whereas values at opposing ends should tend to have opposite patterns of correlations with other values. Consequently, supporting the importance of adjacent values will usually be positively related, supporting orthogonal values is usually smaller or unrelated, and supporting opposing values should be negatively related. This pattern illustrates the compatibilities among the motives that values serve, but it also reflects predicted compatibilities and conflicts among the motives. This feature is significant, since in previous models there were only few predictions about which values were more to conflict likely and why – for example, equality-freedom model of ideology (Rokeach, 1973). Analyses of patterns of correlations between values using the SVS in over 70 countries supported the circular preconditions of the model (Schwartz & Rubel, 2005). However, the use of the SVS in some less developed nations and in parts of Asia, like in China and India, has not supported the model (Schwartz, 1992). This phenomenon has developed a debate about the extent to which Schwartz's model is valid across cultures.

Within SVS, it is difficult to indicate that a respondent's interpretations of abstract-level values are equivalent across cultures (Peng, Nisbett & Wong, 1997), a notion that challenges value research. The abstract nature of values makes them difficult to assess. When individuals speak about values or rate their importance in surveys, which instantiations they actually have in mind remain an open question. Even if the SVS offers synonyms to narrow the mean-

ing of values, for example, equality defined as 'equality of opportunity', this may be insufficient in preventing substantial differences in interpretations and construal. Meanings of values vary depending of the contexts that people bring to the inquiry (Seligman & Katz, 1996). Nonetheless, research into people's ratings of the importance of abstract values matter because rating values as abstract concepts predicts related behaviour and judgments (Rokeach, 1973; Schwartz, 1996), although studies indicates that the size of the value-behaviour relationship is small (Kristiansen & Hotte, 1997). Methodological problems occur inevitably when attempting to predict particular behaviour from an abstract concept (Ajzen & Fishbein, 1997). There are still indications that values prediction of behavioural intentions improves significantly when people explicitly view their attitudes as being related to their values (Maio & Olson, 1994; 1995; 2000).

In real-life situations, people refer to values as abstract concepts, but applying values must be done concretely. Since both the abstract and concrete existence of values constitutes a challenge for research, one possible approach is to start with the assumption that the twofold existence of values can be analysed by explicitly scrutinizing values as mental representations. According to this view, values are similar to other cognitive concepts varying in breadth, concreteness, accessibility, and connections to other constructs, among other characteristics. In examining values as mental representations, it is important to search for connections between values, for which Schwartz's model provides a practical basis. Thus, values do not exist in isolation from each other; instead, the development and application of a particular value should be linked to the development and application of other values (Rokeach, 1973).

Evidently, the examination of values, either between individuals or between individuals and organizations, or another collective, is complex. It appears that all methodological approaches have at least some problematic elements. However, one of the least complicated methods is to ask respondents to estimate the importance of their values, as they are asked to do in SVS. It is presumed that respondents (1) know what values are, (2) know their own values, and (3) can make comparisons between values, considering their relative importance.

4   THE CASES

The general research question behind this study exploring the structure and function of values in terms of their different aspects in the context of technology design. This chapter introduces seven publications to explicate the different aspects of values attached to the issue. The objective of studying articles I through III was to examine those values that are important principles of action in HTI design, and to examine how values are structured in terms of their relationships to each other. Articles IV through V speak to what it means when values are integrated into design. The issue is presented through the concept plan PeopleNet that represents an example of design decisions being constituted from an ethical basis. Article VI discusses the impact of technology at the societal level. Finally, article VII examines values conceptually through the relationship between the concepts of disinformation and information.

4.1 Empirical Value Study of Engineering Design — Human Aspect

In the empirical study, the work-related values in engineering professions are explored. The aim of the research is to reveal the contents and roles of values that pertain to actual design processes and decisions, and that, more generally, are presented in other organizational actions, like public relations or communications. The collection of data within several corporations in Finland was executed during the fall 2008. The study consists of two separate structured inquiries that were delivered to respondents via companies' intranets by Finnish Federation of Design and Consulting Agencies Union (SKOL). The criterion for selecting participants was the corporations' domain in engineering. In the first inquiry, the values considered guiding principles of action at the organizational level and in field-specific professional practices in engineering were studied (N=122). The other inquiry was similar, but the field-specific question pattern was replaced with questions about values that are considered

guiding principles of action in the respondent's own work (N=118). Both samples consisted mostly of personnel of giant corporations. The inquiries were formulated for measuring values that by definition are considered profound and universal in nature and prevalent within groups of people (Schwartz & Bilsky 1987, 1990).

The comprehension of values is principally based on Schwartz's (1992) definition. According to his theoretical assumption, values are cognitive representations of three types of human requirements: basic biological human needs, social interactional requirements, and the social and institutional demands of group welfare and survival (Schwartz, 1992, 1994). Additionally, values are defined as conceptions about central or desirable objectives of individuals, society, or mankind (Kluckhohn, 1951/1954; Rokeach, 1973; Hofstede, 1980; Allardt, 1985). In the study, values refer to individuals' positions to a certain objective that are been named in the survey. The design of the inquiry and of the study follow the guidelines of value research tradition, but a content-based view is used to interpret the results.

4.1.1 Article I

Maksimainen, J., Saariluoma, P. & Jokivuori, P. (2010). "Corporate Social Responsibility and Values in Innovation Management", in *International Journal of Human and Social Sciences,* Vol. 5, 2, 97-101.

The objective was to explore the experienced importance of CSR in engineering design, and to examine demographic variables that explain the variation of CSR within the sample.

This article reports the results of a study in which the deviation of Corporate Social Responsibility (CSR) valuation was measured between employees in different positions in the organization. CSR was measured as a value set wherein the combination of included values reflected CSR's economic, social, and environmental aspects. The variables affecting CSR valuation were separated. The results designate systematic differences within the sample. An individual's position in the organization significantly affects CSR valuation. Among the groups of CEOs and middle managers, the importance of CSR as a motivational foundation that directs actions was highly emphasised, whereas within groups of employees in lower positions in the organization, the importance of CSR was considered minor.

4.1.2 Article II

Maksimainen, J. & Saariluoma, P. (2010). "How Human Resource Management and Human Capital Management Influence Corporate Social Responsibility", in *The International Journal of Knowledge, Culture and Change Management*, Vol. 10, 2, 111-126.

The objective was to explore how respondents' mental models of organizational relations (factors HRM and HCM) affect the experienced importance of CSR. HRM represents the respondents' views on the organization's external processes, whereas HCM refers to respondents' views on the organization's internal processes in terms of conceptual contents.

This article reports the results of a study that examined the effects of two different human management approaches, Human Resource Management (HRM) and Human Capital Management (HCM), on CSR valuation. The variables HRM, HCM, and CSR were operationalised by using factor analysis. Linear regression analysis was used to examine the relationship between the variables. The basic hypothesis was that the human management approach practiced in the organizations has an effect on CSR internalization within employees. HRM and HCM represent different perspectives on organizational relationships in terms of conceptual contents. The main finding was that HCM approach predicts significantly stronger CSR internalization than did the HRM approach. A high correlation between factors for both HRM and HCM implies that the two perspectives should be seen as mutually reinforcing rather than contradictory. CSR factor seems to be more closely associated with the HCM orientation. This means that advancing CSR in an organization's internal process and personnel with HCM orientation is more sensitive to the issue.

4.1.3 Article III

Maksimainen, J. & Saariluoma, P. (2011). "Expertise and Mental Contents of Value Orientations—Outlining the Elements of Innovative Engineering" in *Conference Proceedings of World Academy of Innovation and Management,* 7-14. Paris: WASET.

The objective was to explore types of value-orientations, i.e., thought models directing actions that the sample represents, and how respondents' estimations concerning their level of expertise affect such orientations.

Value orientations were operationalised by using principal axis factoring. The relationships between variables were then analysed to determine whether dependent variable 'expertise' affects value orientations. Three different value orientations, *Status, Adaptation,* and *Self-Regulation*, were found, based on their contents. Value orientations are conceived to be motivational bases and qualitatively different modes that direct thinking processes. When the correlations between value orientations and expertise were compared, the results indicated a loose connection. Expertise as reflected in respondents' self evaluations does not seem to be a defining factor in relationship to a respondent's value orientation. Expertise constitutes the foundation for competence, whereas value orientation reflects the motivational foundation for action. According to the results, in thinking processes, these aspects function separately, at least in some extent. However, respondents with high evaluations of their expertise consider value

contents more important in their work than do respondents with lower evaluations of their expertise.

4.1.4 Discussion

The information contents of mental representations of values constitute an alternative conceptual foundation for HTI design value research. The approach is attached to the content-based psychological research and the concept that human mental representations have information contents (Saariluoma, 1997, 2003a). As stated, the design of the survey follows the value research tradition, and a content-based view is applied only to interpretation of the results.

The approach aims to provide grounds for investigating the relevant types of mental processes constituting the conceptual contents of mental representations of values, and to discuss whether a content-based view of values could complement a theoretical reference frame for describing and measuring such cognitive mechanisms. In psychology, the phenomenon of mental contents is used to explain human actions and behaviours, and can be structured as the psychology of mental contents (Saariluoma, 2003a; Saariluoma & Nevala, 2006). Content-based psychological research has been applied, for example, in user psychology in which users' mental processes, motives, and emotions are investigated during interactions (Moran, 1981; Saariluoma, 2004; Oulasvirta & Saariluoma, 2004, 2006). To the present study, content-based analysis of design mental contents allows an important addition to a rather unelaborated concept of value with more refined psychological, sociological, and analytical notions.

4.2 PeopleNet—Practical Aspect

The gap between rich and poor nations and between rich and poor citizens in industrialized countries is disturbingly wide. As business, employment and educational opportunities, medical services, and other necessities of life move further into cyberspace, the gaps between the rich and the poor become worse. In the context of this dissertation, PeopleNet should be considered an example of a plan for empowering the underprivileged by branching open ICT principles. The next two articles discuss how the reduction of poverty can be advanced by means of new ICT principles and practices. The focus is on mobile solutions, because evolutions in developing countries are revolutionizing mass communication and service practices in the countryside (Scott, Batchelor, Ridley & Jorgensen, 2004; Sachs, 2005; Kaplan, 2006; Kinkade & Verclas, 2008). However, it is obvious that similar services can also be realized in fixed networks.

4.2.1 Article IV

Saariluoma, P., Helfenstein, S. & Maksimainen, J. (2009). "People Net Against Poverty", in *Asia Journal of Global Studies*, Vol. 3, 1, 51-59.

http://ajgs.org/index.php/AJGS/article/view/41/103.

The objective is to describe a concept plan *PeopleNet*, a virtual community service based on open ICT principles that provides practical information to underprivileged people.

The digital divide challenges a productive and sustainable ICT use culture among the underprivileged. PeopleNet is a socially responsible project scheme derived from ethically sustainable principles. PeopleNet is a scheme for a virtual community service based on open ICT-principles, focusing on realization of underprivileged peoples' information rights, and providing means for them to improve their standards of living themselves. The core idea of PeopleNet is to help people improve their living situations with practical how-to information, such as goal-oriented and action-based information. This is called emancipation relevant knowledge (ERK)—providing knowledge that can help individuals solve practical problems or attain personal goals. Applying innovative human-action-oriented, culturally sensitive, ethically sound initiatives, and involving the actual users makes a concept such as PeopleNet possible.

4.2.2 Article V

Saariluoma, P., Maksimainen, J. & Helfenstein, S. (2009). "Introduction to the Concept of People Net—A Learning Tool and Service Net for Poor and Under-educated People", in *Asia-Pacific Collaborative Education Journal*, Vol. 5, 2, 63-80. http://www.acecjournal.org/.

This article continues the discussion of the concept-plan PeopleNet, discussing the issues of knowledge needs and activation of the underprivileged and the main phases in developing such service.

The issues of information needs and rights of disadvantaged people, PeopleNet's positioning in modern ICT culture, and the main phases of PeopleNet's realization are discussed. Two sources of poverty and the related manifold limitations it imposes on people's livelihoods are ignorance and the inability to use possibilities to improve one's circumstances. ICT offers many effective ways for the underprivileged for acquire the knowledge they need. PeopleNet is an instrument to assist these people by providing them the means to improve their lives through information systems. Complementary to other poverty reduction programs that concentrate on globalization, politics, and economics, PeopleNet is a sound initiative to further affect information technology.

4.2.3 Discussion

The vision behind the PeopleNet concept emphasised the principles behind the Web 2.0 paradigm: From ease of use to multi-user platforms and social net-

working, it appeals to the basic psychological needs of users by means that could be better related to the disadvantaged than traditional media. The objective is to offer inexpensive access to the information net to poverty-stricken people living in poor nations, to provide tools that people can use to help themselves in their daily activities. PeopleNet is a human-technology approach-driven, open community-based, mobile service project that aims at constructing an interaction platform for generating and sharing ERK (emancipation relevant knowledge) that empowers the underprivileged to take informed actions to solve their daily problems. This knowledge may include any topic identified as relevant by the poor themselves, including the domains of health, agriculture, commerce, or social relationships. People Net concept developed from a state assessment of globally increasingly well available technological equipment that is yet still relatively inadequate for exploiting these means. There is much need for design improvements and adaption. PeopleNet commences such developmental work that derives from ethical design principles; the development of such a service is based on the 'right to information' described in the United Nations' Declaration of Human Rights. The inert data do not transform into emancipation-relevant knowledge; data must be designed and directed toward interactive actualization that requires extensive understanding of the ecology and psychology of poverty.

The problems underlying poverty go usually together with the problems of realizing people's information rights (Ocholla, 1998), an insight that has given rise to the human rights' approach to poverty reduction strategies (OHCHR, 2004) and has underscored the role of modern ICT tools and services. Still, to develop feasible and effective mobile services for underprivileged people, a good understanding of poverty (Carr & Sloan, 2003) and critical assessment of the role of information and people's exploitation of ICTs are warranted. In a wider context, the preliminary plan for PeopleNet is attached to the issue that nearly everyone on earth will have access to daily news; to texts, documents, and artworks from museums and libraries around the world; to religious, political, and other social practices of people everywhere. What will be the impact of this sudden and profound 'global education' upon isolated communities, political dictatorships, coherent cultures? The diffusion of mobile technology in growing developing economies such as the BRIC countries is naturally an inspiring socio-economic phenomenon. Still, in this development, a real innovation-driven interest must go beyond a penetration-based adoption point of view, addressing the core question about how newly available ICT-tools are transforming people's lives. Henceforth, not just availability and diffusion of inventions, but also integration in use cultures and an effective leveraging of the instruments are the ultimate innovation criteria (Heeks, 2002; Bar, Pisani & Weber, 2007). This is especially true for those community sectors in which mobile technology can and should make a tactile future difference.

In this dissertation, the scheme of PeopleNet represents a project plan that derives from ethical principles, in which internalized values are actualized in project design. There are many relevant points about the development and

spreading of mobile technology, but poverty and user empowerment are un-doubtedly major global use concerns that require the understanding of social justice issues, as well as comprehension of sustainable development, by actors in the technology industry. This is reflected in the stances of humanitarian NGOs and policy-makers and has long captured the attention and imagination of the mobile industry (Vodafone, 2005; Sood, 2006; Motorola Inc., 2009). Despite massive technological progress in recent years, it remains difficult to appraise its social impact, particularly with regard to poverty (Ramirez, 2003). Phenomena such those related to the digital divide suggest that the vision of improving the state of human rights in the world by means of modern technology is compromised. Serious and theoretically properly founded actions are therefore definitive. Principally, it seems that although most key players necessary for realizing a mobile solution to poverty alleviation are already involved, there is often a crucial missing link that calibrates human rights thinking and action to fit technology use.

In the larger societal perspective of the many constraints presented by these times, paving the road ahead will be challenging. Therefore, the awareness of values should be furthered among industry players, who should make the most efficient use of existing resources and avoid wasteful duplication of effort. Commitment is needed to use technology and resources to help people communicate, foster the flow of information and knowledge and accelerate the pace of development, transform vision into reality, and transform the digital divide into digital opportunities to promote peace, sustainable development, democracy, transparency, and good governance. The challenges of actualizing such effort are multifaceted: how to improve current international Internet coordination arrangements without undermining the stability and reliability of the Internet, how to provide affordable access to all without jeopardizing existing, and effective, financial mechanisms, how to ensure network and information security without affecting people's human rights. Clearly, these challenges will require recognition of certain values in HTI design and commitment to work together to realize the full benefits of the Information Society. Ensuring the results of today's knowledge-based tools are within reach of people living in even the most impoverished economies; providing access to those tools to everyone will be the true test of an engaged, empowered, and egalitarian Information Society. Communication and information must be freely and readily available to all humanity, not just the privileged groups.

4.3   Information Society—Socio-Cultural Aspect

The third theme of this dissertation concerns Information Society (IS) and the values that hold greatest importance in the visions of IS driven by the knowledge economy. The emphasis is on the global nature of IS, and according-ly on what direction current IS visions are directing the development. In the next section, the spirit the actualization of the IS vision are briefly discussed. As

described previously, access to ICT, to the Information Society, has been uneven. Educated, rich inhabitants of developed countries all have greater participation rates in the information driven world economy than do the poor, rural inhabitants and uneducated from developing countries. Yet the relationship between faster access to information and well-being or quality of life is not clear. New technologies and the development of IS should be analysed in connection to well-being and sustainability.

4.3.1   Article VI

Halttunen, V., Maksimainen, J. & Pirhonen, A. (2010). "Less, Slower, Better. Do Information Society Visions Have Healthy Alternatives?", in R. Suomi & I. Ilveskoski (eds.), *Proceedings of the Third International Conference on Well-Being in the Information Society (WIS 2010)*. Turku, TUCS General Publication, 56, 77-88.

This article outlines the development of the Information Society, in which individuals are connected with technology in terms of individual wants. In the article, the techno-centric view on such development is questioned and discussed in terms of (social) well-being.

Multiple approaches and interests co-exist in discussions about the development of the Information Society. The first difficult issue is the definition of the concept itself. Current discussion appears to take it as a given, as if we already had a common understanding of it. However, the human-centred ideals are not necessarily realized in technology-driven ideas about the implementation of an information society. The article discusses of technical issues that currently dominate both public and academic discussion of the Information Society. There appears to be abundant optimism about the application of new technology in the construction of an Information Society. Individualism, formalized in the notion of postmodernism, promotes the idea of an individual-centric Information Society in which individuals are connected with technology in terms of individual wants. This article questions the current trend, in which the bigger picture seems to be lost. There are already clear indications that the cost of the prevailing IT-driven cultural phenomena will be high in terms of well-being. Neither the pursuit of IT based on productivity and economic growth, nor the striving for ever-faster access to information and social networks has much to do with well-being or quality of life. In the visions of construction of the Information Society, IT may have an important role, but rather than continuously demanding more and faster, the focus should be on quality.

4.3.2   Discussion

The digital revolution in Information and Communication Technologies (ICT) has had a profound impact on how the world functions and interacts, and will continue to play a major role in shaping the global future. Nonetheless, access to the benefits of ICT has not been even, among and within countries, between

urban and rural areas, between the rich and the poor, between the educated and the illiterate, or between men and women. The need to avoid perpetuating the inequities of the past has now taken on a real urgency, which is why many of the world's key players in ICT are taking active steps to bridge this information and knowledge divide and bring the benefits of ICT to all. An example of addressing these challenges of our era, the International Telecommunication Union (ITU), which has coordinated global telecommunications for the past 140 years, has been pioneering a new path by laying the foundations for a global Information Society that seeks to provide universal and equitable access to information and knowledge through widespread use of Information and Communication Technologies (WSIS, 2003; 2005). At the initiative of ITU, the United Nations General Assembly adopted a landmark resolution at the end of 2001 to organize a World Summit on the Information Society (WSIS). Specifically, WSIS is committed to building a people-centred, inclusive, and development-oriented Information Society in which everyone can create, access, utilize, and share information and knowledge, enabling individuals, communities, and peoples to achieve their full potential in promoting sustainable development and improving their quality of life (WSIS, 2003). One goal is to chart the future course of the Information Society, helping to ensure that ICT are globally accessible and devising strategies to use ICT for achieving the development goals enshrined in the United Nations Millennium Declaration. Information has the power to dispel ignorance and empower people to reach their personal aspirations. It has the power to bind communities on a global scale and to spread the common ideals of peace and tolerance, growth and development.

Still, these kinds of visions ignore certain problematic issues. Technological revolutions are among the most consequential things that happen to humanity, and technological change is in large part responsible for the evolution of basic parameters of the human condition such as the size of the world's population, education levels, health care, the effects of human actions in the natural environment, and so on. Aspects of people's individual lives and of society are also influenced by technology in direct and indirect ways, including human relationships and people's views of morality. Altogether, technological capacity is an essential determinant of the ground rules that human civilization is executing. Since technological revolutions have such profound consequences, it seems obligatory to dedicate an equivalent amount effort to ensuring that the right decisions are made, for example, concerning policies, placing objectives, and directing research in the Information Society. However, even the most trivial decisions might have monumental consequences that shape people's lives.

4.4   Disinformation—Philosophical Aspect

The problem discussed within the fourth thematic area focuses on the relationship between intentional disinformation in the context of the Internet and in

relationship to human rights as the foundation of freedom of expression. The Internet has become a powerful means of disinformation. In short, disinformation is inaccurate information that is created intentionally to mislead a user. Identifying inaccuracies is difficult, since the provider wants to hide the fact that it is inaccurate information (Fallis, 2009). Disinformation occurs whenever in process of information fails through lack of objectivity, lack of completeness, and/or lack of pluralism (Floridi, 1996). Fetzer states that disinformation involves the dissemination of incomplete, inaccurate, or misleading information with the objective of deceiving others about the truth (Fetzer, 2008), i.e., any misleading information that is intended to be misleading (Fallis, 2009).

4.4.1 Article VII

Saariluoma, P. & Maksimainen, J. (2011). "Intentional Disinformation and Freedom of Expression", submitted in *International Review of Social Sciences and Humanities.*

This article examines the relationship between disinformation and information: Is disinformation a type of information, or is it conceptually contradictory to the notion of information? Is disinformation protected by human rights (Article 19)?

The Internet has changed the structure of information production, as well as the position of information providers. The focus is on the distinction between information, misinformation, and disinformation, and on the question of what sorts of information or expressions can be said to be covered by human rights principles. Intentional disinformation is always pseudo-information and entails pseudo-ideas. It cannot be true, since it has been intentionally selected on the basis of falsity. Consequently, it cannot be claimed that Article 19 would justify dissemination of intentional disinformation.

4.4.2 Discussion

From a human rights view, as presented in article VII, the issues of intentional disinformation have many practical dimensions. It is not always clear what disinformation is intentional and what is a genuine opinion. However, this is not always a problem. It is possible to prove in many cases that some piece of information is false. In these cases, accidental disinformation can be corrected through arguments. Intentional disinformation has other goals, and correcting it may be problematic. Coping with intentional disinformation is not totally alien to human practices. Article 19 states that everyone has freedom of expression, referring to the right to seek, receive, and impart information and ideas of all kinds. In addition, everyone has the right to hold opinions, which implies that information and ideas also refers to them, implying that there are no means to eliminate disinformation in the web without acting against freedom of speech or human rights.

When analysing the issues related to disinformation in the context of the web, values become the core of discussion when the possible solutions for controlling disinformation are considered, whether they are database applications or education to further cyber-literacy. For example, in preventing distribution of disinformation, accurate information can be censored along with the disinformation. These attempts may lead to restricting plurality and consequently to restriction of the acquisition of true beliefs (Fallis, 2004). Disinformation comes in different forms, and responsibility for the reliability for information should be taken on to protect information users from the harmful epistemic consequences of disinformation. For example, 45% of US citizens make important decisions based on information acquired from the web (Horrigan & Rainie, 2006). The main problem is verifiability. Currently, there are no eligible quality control mechanisms to evaluate the accuracy of the contents, and no instances to verify the reliability of sources. However, expert monitoring, classification, labeling, and censorship have been mentioned as viable solutions (Floridi, 1996; Swaine, 2008; Fallis, 2009). Problems with these approaches on ethical grounds and feasibility may arise. Another solution is to control disinformation through education and training, to provide tools for users to evaluate information. Possible guidelines or policies may help users identify certain information characteristics that are indicators of information quality. There is some empirical evidence that when the indicators of information accuracy were present, a website contains more likely accurate information, even though studies that have tested the characteristics do not correlate with accuracy (Fallis & Frické, 2002; Frické & Fallis, 2004).

The problem of disinformation concerns every web user, and consequently emphasises the critical role of the user as a receiver of information. Therefore, the role of education has become crucial. The American Library Association (ALA) Presidential Committee of Information Literacy Committee promotes ILI (Information Literacy Instructions) as a 'means of personal empowerment' by empowering users to acquire knowledge through their own successful quests (ALA, 1989, 1998; Kapitzke, 2003). However, disinformation introduces challenging new epistemology and learning objectives to ILI. If associated and scrutinized with the epistemic theory of foundationalism, knowledge or beliefs derive from basic beliefs that are internally justified by the individual (Fumerton, 2005). The view has been criticized because of the lack of skepticism associated with the epistemology theory of reliabilism (claiming that the justification of true beliefs is external and occurs through a reliable cognitive process), and because the concept does not encourage users to critically reflect on the information enough (Hooker, 1996). However, whether the epistemic theory behind the learning paradigm is foundationalism, reliabilism, or something else, 'cyber-literacy' requires a set of concepts and critical views with which to understand the content of web information (Gurak, 2001). The concept of cyberliteracy refers to competencies, based on critical literacy that introduces a set of skeptical learning objectives. Critical literacy refers to questioning (electronic) media expressions (Tyner, 1998). According to Warnick, the focus of critical literacy is to

make hidden or non-apparent aspects of communication visible. In Warnick's view, the following actions are listed techniques in cyberliteracy:

- recognising that media discourse is often persuasive in nature;
- questioning the motives, ideology, and values of the authors of a communication;
- identifying the genre of a communication;
- identifying the form of argument, i.e., argument from model or analogy, embodied in a communication; and
- identifying beliefs, values, and assumptions that the authors of a communication assume are held by the audience (Warnick, 2002).

Based on Gurak's and Warnick's views, Stiller and LeBlanc implemented the list of competencies, emphasising the issues related with web communications:

- using the internet to stay informed about current events and other topics;
- using the internet to express political, creative, and artistic viewpoints;
- the variety of social and ethical issues associated with Internet communication;
- the dangers associated with Internet communication;
- the value of private information and the consequences of divulging this information;
- valuing expressions from a diverse populace; and
- The importance of accessibility and the Internet (Stiller & LeBlanc, 2006).

In evaluating the accuracy of information on the web, the role of the user increases as the problem of disinformation becomes more complex. Therefore, in the ILI paradigm, combining the listed competencies with the competencies of critical thinking increases skepticism. The combination of critical literacy and critical thinking connect both the internal and external epistemic justification assessments that support the critical learning paradigm required when dealing with disinformation.

Since ICTs, the web in particular has become an effective conduit for knowledge distribution and increased use of ICT in most aspects of everyday life. This necessitates careful consideration of values in human-technology interaction (HTI), particularly in relationship to design, but also in terms of access, security, and equity. Such design processes of technology, definitions of the groups of people who will actually use the systems, or which groups have possibly been forgotten must be considered. This common dilemma raises questions of the possibilities of disinformation affiliated with systems that utilize both information and technologies.

5 ASPECTS OF VALUES IN HTI DESIGN

The comprehensive understanding of the relationship between human values and behaviour consists of complex cognitive phenomenon that cannot be reached through traditional, inquiry-based methods or traditional theoretical frameworks that are typically utilized in values studies. The main question arises from the analysis presented in the previous chapter: Could a content-based view of values offer a complementary theoretical reference for describing and measuring the cognitive mechanisms of construction of values? Through new perspectives, knowledge concerning the construction of values should significantly increase. Another research question explored the structure of values and examined how values function in real-life situations through their different aspects.

In this chapter, the content-based approach of examining values is briefly revised. Then the hypothetical illustration of the interpretation process of values and the model of values as mental representations are presented and discussed in terms of value aspects that were identified in the articles. Then the findings are contextualised and discussed in terms of the role of expertise in human thinking processes.

5.1 Content-Based Approach in Examination of Values

The articles examined in this dissertation aimed to demonstrate the aspects of values in HTI design. Evidently, values play a prominent role in directing human actions as abstract concepts with different conceptual contents. Therefore, from the viewpoint of a content-based approach, the key interest is in categorizing concepts that individuals use in their interpretations, as well as in the interpretation processes. To achieve more comprehensive understanding of such interpretation processes, close attention should be paid to concepts that are used in the process of interpretation and to the continuums they present in design practices.

The information contents of mental representations comprise the explanatory ground of examination in content-based psychology (Saariluoma & Nevala, 2006). In a content-based approach, clarifications of the functions of content-specific modes of thinking, such as apperception, restructuring, reflection, and construction, in different contexts of problem-solving activities are at the core of attention. When a particular issue is considered a 'value', it requires the individual's interpretation of that issue. Therefore, human values can be considered one type of problem-solving activities. In interpretations, which are closely related to the problem of experience, the mental contents related to a particular value are constituted through perception, apperception, restructuring, reflection, and construction, as well as through the concepts of memory and attention.

Because of the abstract and strongly conceptual nature of values, an individual's interpretation of values differs essentially, for example, their interpretation processes of issues with visually perceivable stimulus, like pictures. In the case of pictures, perceivable and non-perceivable content elements assimilate in an individual's mental representation in constructing sensible relationships between elements in the visual stimulus. Therefore, content elements of values are constituted strongly by non-perceivable contents. When the problem of experiencing values is examined within a reference frame of content-based research, attention should be directed to different types of non-perceivable conceptual content elements in an individual's mental representations. For example, the distinctions can be made between ethical, practical, and social conceptual contents of values. Through these kinds of distinctions, and through paying attention to the interactions of different types of content elements, it is possible to achieve a better understanding of how the individual processes of interpretation tend to proceed, by understanding more specifically how apperception operates in the context of experiencing values. In the examination of interpretation processes, the concepts of restructuring, reflection, and construction function as tools, by which different phases of interpretation can be separated.

5.2   Model of Values as Mental Representations

The empirical part of the study aimed to clarify the differences in conceptual contents of values. Since the collected data were studied by means of statistical analysis, the attention was not focused to individual processes of interpretations. The interest was in categorising the value concepts of participants' experience of selected values according to their estimated importance. To deepen the understanding of interpretation processes of values in a detailed way, the appropriate tasks should be designed and protocols of individual participants must be examined further, for example, by means of protocol analysis, to observe the concepts used and the possible transformation of conceptual structures while the interpretation continues. However, these issues will require future studies.

Conceptual perception may vary during the interpretation processes in different contexts and therefore, through apperception, reflection, and restructuring, new interpretations of mental representations are construed. Based on theoretical discussion and empirical implications, a summary of relationship between sub-processes of value interpretations can be presented. FIGURE 2 depicts hypothetically the process of interpretation through which mental representations of values are construed.
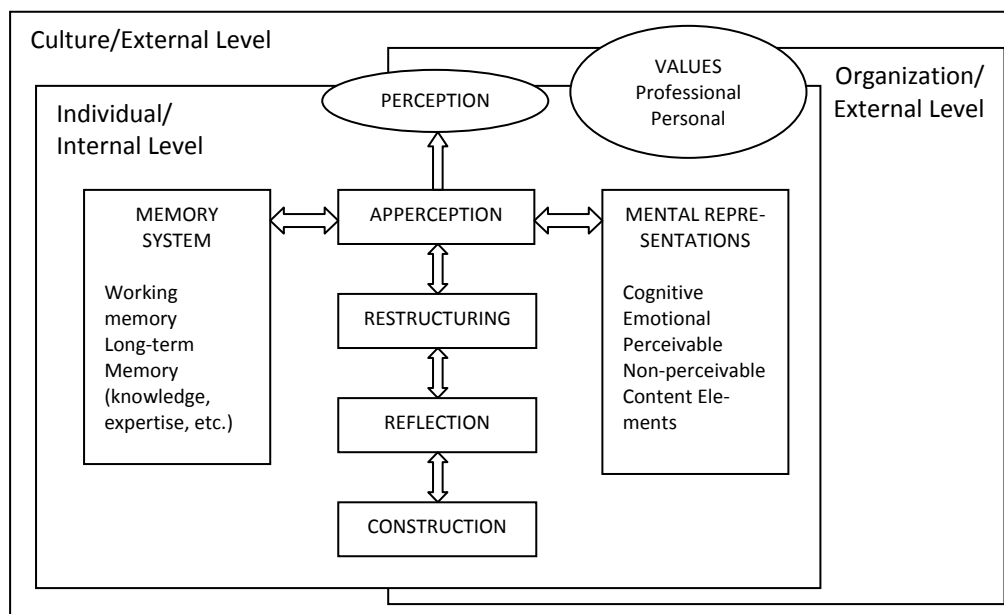

FIGURE 2   Interpretation process of values

Since values do not have direct visual stimulus, perception has a very different role in interpretations than, for example, in the cases of picture interpretations. Instead, apperception has a crucial role in information processing related to human values, since it provides individual self-consciousness and basically is a process through which mental representations are construed. It is also linked with processes of restructuring, reflection, and construction, and with individuals' memory systems. Through apperception, individuals' previous experiences affect their perceptions and evaluations of situations. Perception, a sub-process of interpretation, is a process for receiving information from the environment, but perceivable information that the environment provides has no meaning without apperception. In real-life situations, attention is a stimulus process that directs perception, but without apperception, it is challenging to explain why an individual directs attention to some features while ignoring others. Consequently, it is reasonable to assume that apperception directs perceptions. Without going to more detailed discussions concerning memory, this context requires mentioning that the memory system has a fundamental role in information processing. Working memory holds a role in retrieving information from long-term memory and transmits new and altered information into long-term memory for retrieval. The knowledge an individual holds is stored in

long-term memory. Perceivable stimulus-bound information and information, or knowledge stored in long-term memory are in contact through working memory functions, but apperception creates meaningful structures between different types of content elements in individuals' mental representations. Through construction, groups of sub-representations can be integrated into a consistent entirety.

Mental representations are self-consistent wholes that cannot include inconsistent content elements (Saariluoma, 1995). Certainly, in an individual's mind, two or more different mental representations can be in opposition to each other, containing the same conceptual or other elements that can be used for different purposes. Although apperception constructs mental representations from different types of information, the shift between different representations is not an apperceptive process; therefore, it requires restructuring (e.g., Saariluoma, 1995). In interpretations of values, the shift between mental representations is an important process in itself, from the perspective of other problem-solving activities (Saariluoma, 1995; Saariluoma et al., 2006). Generally, apperception can explain an individual's first association of a particular value concept, but it cannot cover one's experience of the value in question. This is because during interpretation, one's first association may appear to be insufficient or even incorrect. Within these situations, the current mental representation can be complemented, or in the case of incorrect mental representation, one has to shift to another representation, i.e., restructure (e.g., Saariluoma, 1995).

Restructuring as an object of cognitive research has an important position, especially within Gestalt theorists, for example, Duncker and Wertheimer, who have discussed restructuring as a change in the perceptual field (Saariluoma, 1995). Ohlsson (1984a, 1984b) has made more recent representational assumptions attached to restructuring. According to Saariluoma (1995), the distinction between apperception and perception makes it essential to clarify the concept of restructuring. The content of mental representation is more important from the perspective of restructuring than the perceptual scope. Even if a change from one mental representation to another may have perceptual consequences, these are secondary compared to the changes in the representational level. After all, concepts are key elements in understanding human cognition, not perceptions, and therefore restructuring is crucial to a change in conceptual representation (Saariluoma, 1995). In the context of interpretation of values, one's representation can change during the interpretation process because it is possible to apperceive some concepts attached to a particular value concept differently, which might drive one to construct a new mental representation and disqualify the earlier version. Furthermore, according to Saariluoma (1995), mental representations must be verified before they can be accepted, since they are hypothetical solutions to problems. The leading idea behind the whole problem-solving continuum is that if the hypothesis generated can be tested and verified, the solution can be accepted. If verification cannot be found, a new hypothesis must be sought and verified. It should be emphasised that these shifts between mental representations are usually automatic, i.e., conscious attention is not paid to

these processes. In the interpretation processes, it is normal that differentiations have not been made between the phases through which the interpretation is constructed, and that an individual may reconstruct his or her mental representation several times during the process of interpretation, and only the result of this process is presented.

Restructuring seems necessary in cases, for example, in which earlier interpretations of some important conceptual elements have been ignored, or when less important elements have been overestimated. Understanding the process of restructuring can promote understanding the relationship of individuals' emotional and rational experiences during the interpretation process of values. When the value concept is apperceived, emotional and/or rational features of experience are densely attached with his or her current mental representation of the object. In the restructuring process, the contents of mental representation changes, but the individual's emotional aspect in experience may change as well. However, apperception and restructuring are complementary thinking modes. Apperception leads to restructuring and vice versa, but these processes cannot prevail at the same time.

In their investigation, Saariluoma et al. (2006) have observed that designers can have several hypotheses that are mutually inconsistent in content, for example, concerning the materials of the object they are designing. Through apperception and restructuring, alternative solutions to problems can be generated, but for choosing between possible solutions, the process of reflection is needed. Reflection controls comparison and selection between alternative mental representations. The reflection process functions in comparing alternatives that are fundamentally incompatible with each other, whereas apperception and restructuring focus on a single coherent mental representation. In the interpretation of values, reflection has an important role, since through reflection, several inconsistent interpretations can be constructed, although it is not possible to construct conflicting interpretations of some values simultaneously. One interpretation can be constructed first, and another can be constructed after that. If there are several conflicting interpretations, they can be compared through reflection and evaluated to determine which is most comprehensive.

Besides reflection, there is also a process of construction (Saariluoma et al., 2006), which is applied in cases in which the problems are so complicated, like in HTI design, that it is necessary to divide them into sub-problems. The solutions to sub-problems are combined into one coherent representation through construction, which differs from restructuring and reflection, since it generates integrated representations. Construction differs from apperception in that it integrates a group of solutions together, whereas apperception entails only one sub-problem and solution to it.

5.2.1 Structure of Values

Results of empirical study (articles I-III) have shown the differences in value structures that illustrate a structural model of values as mental representation. The results show the value concepts that participants thought held importance,

and the relationships between these concepts, which are called value orientations. Value orientations that are compounded of different conceptual contents can be understood as conceptual perceptions of mental representations that differ among the sample. FIGURE 3 illustrates the structure of values through examples (see article II).
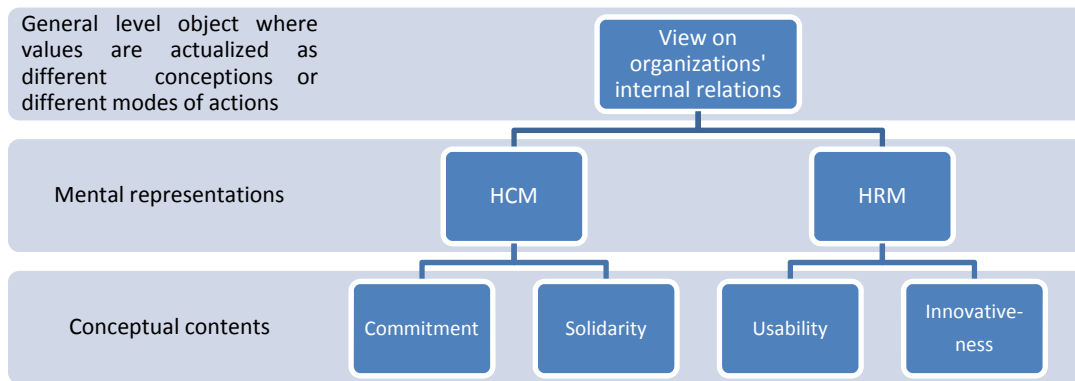

FIGURE 3   Structure of values: Value concepts related to views of organizations' internal relationships

In the example, HRM (Human Resource Management) and HCM (Human Capital Management) have different views of organizations' internal relationships. The hierarchical structure does not reveal the experienced importance of values, but the relationship of particular concepts. In the empirical study, two different value orientations, i.e., conceptual contents, were specified that were associated with the views. The illustration does not reveal the cognitive processes involved in the construction of mental representations in either the case of HCM or HRM, or generally. Nonetheless, the structure of values must be exposed to their contents to have meanings. In future studies, to understand the roles of cognitive processes in generating meanings into mental representations, the processes of interpretation, apperception, restructuring, reflection, and construction must be studied. Even if in peoples' experience the importance of values may be structured hierarchically, the associations between conceptual elements are supposedly associated with each other more randomly. The FIGURE 3 above presents a result from a study that was executed with a structured inquiry: The value concepts were defined by researcher. If participants were allowed to describe freely the concepts they attach particular value to, the structure and relationships of concepts would presumably seem different. Based on the hypothetical interpretation model of values (FIGURE 2), the process might proceed in these steps:

- conceptual perception and evaluation of the concept and first interpretation;
- re-examination of the concept and of conceptual elements attached to the value concept within first interpretation;
- formation of new conceptual perception;
- restructuring of mental representation, if elements attached to the value concept in earlier interpretation are not consistent with new notion of the value concept;

- reflection, i.e., comparison of two or more alternative mental representations; and
- construction of new interpretation based on apperception of the value concept.

As a hypothetical and simplified example, if a participant was asked to think aloud about the concept of *equality*, interpretation, based on previous assumptions, does not proceed linearly in conceptual thinking. Interpretation proceeds circulation, in which new concepts are associated with mental representation. If the contents of mental representation are in strict contradiction, the interpretation is restructured, and participants abandon the concepts that contradict the interpretation. This means that the conceptual contents are transformed to correspond to the new interpretation, and so on. In real life, the processes may continue through lifetime, and new conceptual contents may be added to interpretations through new experiences and changing situations, even if human values are, in principle, relatively stable entities.

Supposedly, the interpretation cycle continues until one has found an acceptable solution. Within a content-based reference frame, interpretation of values can be seen as a human problem-solving activity. When such interpretations are studied through apperception and its sub-processes of restructuring, reflection, and construction, this type of problem-solving becomes more comparable to other problem-solving activities like chess playing or design. In the context of human information processing, apperception, restructuring, reflection, and construction may have explanatory strength when studied experimentally. Through examination, better understanding of conceptual processes of interpretation of values can be reached.

5.2.2 Aspects of Values

Values can be very complicated objects as concepts. For example, the interpretations of concepts such as *sustainability* or *corporate social responsibility*, or ethical value concepts such as *freedom* and *equity*, include several different aspects. When studying them, one can find partial solutions to his or her questions, such as what symbolic, practical, or ethical meanings concepts are associated with. However, in addition to examining the interpretation processes, in the context of values, the 'spheres' in which values are applied and actualized through human actions should be discussed. TABLE 5 illustrates practical examples of these 'spheres' or aspects that are presented in the articles and that can be solved in the interpretation process of values in the context of HTI design.

TABLE 5   Examples of related issues and operations in actualizing specified aspects of alues

Aspect	Examples of related questions
Philosophical	How are the design decisions justified? How do we avoid misusing technology? How are technology-related laws and regulations grounded?
Practical	What benefit does a particular technological solution produce? Is the particular technological solution functional? Does the production process result in unwanted consequences?
Human	What values direct the design decisions? What is considered important? Does the technology serve the real needs? Can misuse of a particular technological solution be avoided?
Socio-Cultural	How can technology serve society in an ethically sustainable manner? Does the designed devices or services correspond to the demand? How are the values of different cultures taken into account in developing services? What are the consequences of designed technology in the long run?

These philosophical, practical, human, and socio-cultural aspects of values represent the spheres in which values relate and are to be interpreted in design practices in the context of this study. The p*hilosophical* aspect refers to meta-level of values, where judgments of what is desirable, or morally good, i.e., good in itself, are made. The second aspect is *practical*, referring to instrumental values with some technical abilities. In the context of HTI design, the *human* aspect indicates the actor and constructivist comprehension of the individual as a locus of knowledge construction. The human aspect is defined by an individual's personal preferences, competencies, and so on. The last aspect is *socio-cultural*, referring to those relationships in which values actualize. Philosophical, practical, and socio-cultural aspects of values can have their meanings only through individual information processing. As noted, interpretations are construed linearly piece by piece; First one element, then the second, and finally the interpretations that were given to singular elements are combined into a coherent whole. In this meaning, construction is important in the context of value interpretation. The aspects of values presented above illustrate the types of general-level questions that need to be answered, when interpretations are construed in specific situations. Values are not just abstract entities. Instead, they take form in decisions that are made and the behaviour that results from such decision making. Generally from a psychological viewpoint, values play a significant role in becoming conscious of the reality. Therefore, they are essential position in design, as well as in other areas of life. From the point of view of design, values are important factors in explaining human actions, since they create extensive systems. By understanding these systems, it may be possible to predict some behaviour patterns somewhat reliably.

Values are not only individuals' private matters, but in the most extensive sense, are also collective matters. Values in HTI design practice, described in

this study, can be summarised to represent views on technology in a conceptual model of values along three continuums:

Product developer-user:
Internal to external
Private to professional

Technology-content:
Device to information
Professional to public

Local-global:
Subjective to collective
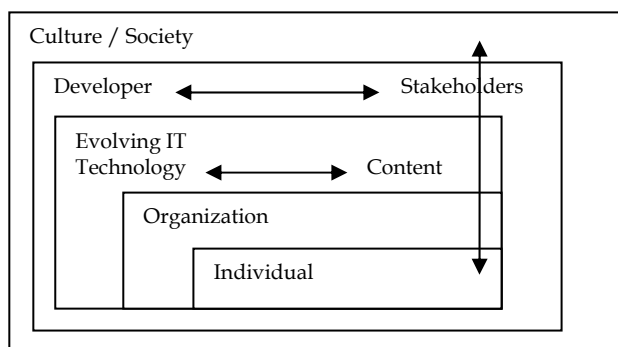Organization to culture

FIGURE 4   Actualization of values in ethical IT

Generally, continuums (FIGURE 4) represent the 'routes' through which and wherein values actualize, from mental representations to particular behaviours. Such a model can be used on an individual, organizational, professional, or discipline level to restructure or re-conceptualise designers' professional scope and to guide future planning from ethical viewpoints. The model builds on features that were recognised previously through empirical research, which found that some (ICT) technology researchers prioritise users over product developers, stressing the information accessed rather than the enabling technology (Bruce, Pham & Stoodley, 2004; Pham, Bruce & Stoodley, 2005). From an ethical point of view, a trend toward consideration of end users and their information needs is a step in the right direction (see articles IV-V). This is indicated in research that shows some professionals reaching beyond the technology and the view of users as clients, to humanity (Stoodley, 2009). The ethical responsibilities of HTI design professionals are represented in the model along a continuum from a subject-oriented to a collective-focused view. Thereby, designers as professionals must consider that they belong to related dimensions of reality: Individual, organizational, stakeholder related, and socio-cultural realities. The concept of 'reality' indicates ethical conceptions wherein particular rights and responsibilities are constituted.

The model introduces actors in HTI design to broaden the horizons of responsibility, starting from their individual level to the socio-cultural dimension. Philosophically, the model is supported by Koehn's philosophy; a relationship based on promise-making and trust is the only defensible ground for professional ethics (Koehn, 1994). By stressing the relationships of responsibility towards others as the essence of ethics, Levina's philosophy (1998) is in line with the model. In the context of HTI design, specifically when considered from the perspective of the whole branch of industry, ethics must be seen as an attitude, centred on the 'other'.

The core of scientific interest in this study concentrates on the individual level in the contents of mental representations of values. Yet, it is important to

recognise the existence of those parallel realities in which individual designers are involved.

5.3   Problem-solving and Expertise Factor

The empirical results that were presented in article I indicated that the participant's level of expertise affects the experienced importance of values as guiding principles of action in professional procedures. What causes the differentiations between experienced importance of values within individuals in different organizational positions was not explored. The given subjective meanings of values were not determined, since from a content-based viewpoint it is reasonable to expect the expertise factor to have an effect on the content-elements of values. Values carry both personal and cultural meanings. Some individuals attach conventional and culturally shared meanings to particular value concepts, and consequently, there are similarities in perceptions of values. However, the meanings of the concepts are apperceived differently. In apperception, an individual's level of expertise may function in linking wide cultural, professional, or other narratives to concepts. However, when values are related to human thinking processes as a problem-solving activity, through expertise, an individual is likely have more situation-relevant conceptual tools in use.

The leading idea of problem-solving studies is to clarify the conceptual processes of human thinking. Problem-solving research was launched by psychologists, for example, Külpe and Selz, but problem-solving activities were objects of interest for Gestalt psychologists also (e.g., Dunbar, 1998). An important task in problem-solving research has been chess playing (Saariluoma, 1995). In comparing chess playing and interpretation of values, there are important differences. For values, there is no distinct rating system for ranking individuals' interpretations. In addition, as a task, chess playing is more controllable because of clear rules and objectives, which do not require interpreting values in particular situations. Naturally, the objective can be making interpretation so retentive that it cannot be replaced, but there can be several acceptable interpretations among individuals, even contradictory ones. In chess playing, it is possible to define the moves a player can make from certain positions and judge which is best. In interpretation of values, there is no such well-defined problem-solving space. In its early stage, problem-solving research concentrated on problems such as puzzles, but later investigation has been directed to more complex tasks from domains such as medicine (e.g., Dunbar, 1998). One context of problem-solving activities has been medical diagnosis (e.g., Ericsson & Lehmann, 1996). Studies have shown that in terms of clinical information and diagnostics, experts have acquired higher-order concepts that replace the biomedical reasoning of medical students. Typically in the medical expertise studies, the investigation has focused on how these different knowledge types contribute to acquisition of expertise. Within these studies, the exemplary theory and prototype theory has played an important role (Norman, Eva, Brooks &

Hamstra, 2006). The basic assumption in prototype theory is that category prototypes contain more features that are characteristic to a particular category and fewer features characteristic to other categories. For example, some results have shown that prototypical diseases are received as more representative and identified faster than less prototypical diseases. Problem representation seems to be one crucial element in expert reasoning. In medical diagnosis, according to exemplar theory, all the learned categories are accompanied by examples acquired through experience. Examples are individually retrievable, providing support for future categorization of cases that have similarities to prior examples.

In medical diagnosis, expertise seems to proceed from prototypes to ambiguous examples. When comparing medical expertise with expertise in HTI design, or expertise in general, it is plausible that there are similarities between different domains. Earlier research indicates that expertise is related to the individual's use of higher-order concepts (Saariluoma & Nevala, 2006). In a professional context, designers probably construct mental representations of their subjects in ways that share both similarities and differences in these representations between individuals. Differences in construction of mental representations and in interpretations processes between individuals are naturally typical. When values are discussed concerning conceptual contents of mental representations, there are important differences between expertise-dependent information contents and information contents of values. First, in the context of values, strong emotional factors might occur. Second, because of the collective aspect of values, specifically work values, the possible contradictions between subjective and organizational values (or in a wider context, contradictions between subjective and cultural values) constitute an interesting starting point for studying functions of restructuring. Finally, one important difference is the absence of direct perceivable (retinal) stimulus.

In the wider context of constantly ongoing technology development, some value concepts such as the concepts of 'privacy', 'security', and 'freedom' require reinterpretations. With these kinds of concepts, interpretations could fail, almost in the same sense as a medical diagnosis can fail. For example, in application development, designers misinterpret or misevaluate the possible privacy risks the use of application may bring, so errors in the design process may occur. If the relevant information types comprising the mental contents (Saariluoma et al., 2006) of values in particular situations are analysed, types of mental contents that appear in that situation can be found to, for example, recognise possible value conflicts. Individuals can interpret values in numerous ways. Since values function in a number of ways in different areas of human life, it is important to achieve knowledge about cognitive processes that direct the interpretations of values. To gain such understanding, the processes of restructuring, reflection, construction, and specifically apperception must be studied carefully. After all, it should be noted that interpretations cannot be made if the situation is not apperceived somehow. For example, interpretations of values cannot be

made before mental representations of them are constructed through apperception.

6   DISCUSSION

In this chapter, the key findings are summarized and discussed briefly in the content-based approach for analysing values in HTI design and the larger framework of scientific progress, and some concluding remarks are presented. The thesis ends with a discussion of future research.

6.1   Summary

The most significant finding of this research was the view on values through their contents. Through the analysis of contents, the essence of what values actually are, both in individuals' conceptions and as actualized behaviours, can be reached. Previous research is connected to tradition that derives from Westermarck and his empirical research of ethics (Westermarck, 1891/1925).

The empirical results indicated first that respondents' positions in the organization predict the considered importance of values as guiding principles in professional actions. Generally, respondents at the managerial level consider values more important than respondents at lower organizational positions. Second, respondents with a tendency to consider social and interactional values important in organizational relations (HCM orientation) are more sensitive to corporate social responsibility issues than respondents with a tendency to consider technical and achievement related values (HRM orientation), according to the results. In terms of conceptual contents of values, three value orientations were identified: *Adaptation, Self-Regulation*, and *Status*. Value orientations were examined in relationship to expertise, which seems to be somewhat a separate mental construction in relationship to a person's value orientation. Values that direct design come into focus in discussions concerning the effects of technology on societies or individuals. The consequences of the processes of design are complex and prevalent. For example, at the individual level, the use of technology has affected changes in behaviour, as well as motivational, cognitive, and emotional changes. In the societal level, there are changes in institutions, organ-

izations, and working life in general, caused by initialization of different technologies. Because of such penetrating consequences, examining the values of directing development and usage—whether those instances are political, economical, or industrial—is crucial to gain explicated knowledge about the values as motivational forces behind such development.

The main argument is that effective means for influencing ethical behaviour of the actors in the field rests in influencing their conceptions of their practices that are driven by values. The focus of this thesis is on understanding the conceptions of values. Through facilitating HTI designers to encounter alterative content-based points of view, it is possible to achieve a psychologically grounded understanding of the conceptual structure of values, as well as the variance actualized in behaviours. At best, this results in professionals living out an internally re-interpreted view of their practice. After all, a change of behaviour derives from a change of conception, conducted through apperception, restructuring, reflection, and construction. The analysis of mental contents related to mental representations of values in different contexts, for example in the work environment, can be used to explain differences in individuals' behaviour.

According to Kuhn (1962/1970), different paradigms of a particular discipline are incommensurable. Sellars, instead, notes that talk of reasons, epistemic justification, and intention is not the same as, and cannot necessarily be mapped onto, talk of causes and effects in the sense that physical science speaks of them. Sellars does not believe that describing and explaining are the only dimensions of linguistic activity, but that prescribing, evaluating, and negotiating are equally indispensable dimensions of language use in which science is not privileged (Sellars, 1956/1997). However, there is a change of central concepts and presuppositions of content-based analysis. For example, in Schwartz's theory of human values, they are not exclusive in relationship to each others, but rather complementary. The relevant problems and research objectives are defined in different manners within these disciplines. The main point here is that mental contents may provide the important conceptualization that is equal to more standardized views of human values. Content-based analysis can be used in solving different types of problems from those considered in more traditional disciplines, in which values are conceived, for example, as motivational bases of action or attitudes without examining their conceptual contents. However, while science progresses, the assumptions of previous paradigms do not necessarily have to be abandoned. Instead, ways to match them with research problems to which they can provide answers must be found. After all, communication between different disciplines may better reveal the phenomenon under examination as a whole, and combining perspectives can add lend accuracy to the explanation behind such phenomenon.

6.2   Concluding Remarks

In the field of information and communication technologies (ICTs), specifically HTI design, this study has explored the role of values and the degree to which human management methods enhance their formulation and functioning. As has been demonstrated, when viewed from a purely content-based point of reference, values expressed in interviews or in answering questionnaires frequently differ from the values actually practiced. In the areas like corporate social responsibility – particularly regarding environmental concerns for the future - there exists a noticeable gap between what is considered and what is actually done.

The preliminary study *PeopleNet* has been used as part of this research, although it does not tie into the topic as strongly as do empirical observations. *PeopleNet* deals with the introduction of ICT devices and systems into a developing country, the objective being to reduce the effects of the digital divide between various groups, defined by features including differences in gender, ethnicity, and level of education. This study was undertaken out of concern for developing nations, the results of which are shown to be at least partly applicable to any ICT design template hoping to diminish the digital divide within or between nations. This study has stressed the importance of internalized values of designers and other participants in the ICT field when seeking to ensure systems such as eLearning applications that would empower their users through subjective choices – i.e. providing what is termed an emancipation of relevant knowledge (ERK) within the context of PeopleNet, thereby decreasing the digital divide. The free and open source approach is regarded as being a suitable way of enabling users to modify the applications themselves.

The content-based approach is applied not only to participants in the field of HTI design but also to various kinds of texts. This approach has been employed here regarding declarations and IT policies as used in the article manuscript VII *Intentional Disinformation and Freedom of Expression*. In this context, application of content-based analysis comes close to the methods and theories of content analysis that have been used for decades in the social sciences and the humanities. Normative analysis of contents evidently shares features with the standard philosophical analysis of concepts and arguments. For example, a foremost pioneer in the philosophy of technology, Bunge, offers not only semantic tools but also a preview of his scheme of science (Bunge, 1998). He describes both science and technology as they are; namely, a clear characterization of all the components of technological systems in systems-theory terms, including their value commitments and relationships to other institutions (Bunge, 1966, 1998). Within the ICT field this should be reflected in how the values of participants – ICT specialists, politicians, and other decision-making individuals – could be engaged in a way so as to see to it that disinformation could not spread by the use of ICTs, but rather scrutinize information so as to insure both justice and security. Critical literacy and critical thinking are shown to be ena-

bling applications for those in need of strategies that lessen the digital divide. The suggestion of using free and open source systems coincides with the concept of critical thinking, which is as clearly needed. Put simply, this enables users themselves the kind of knowledge selection and creation methods that can be passed along to the less privileged.

The overview in this dissertation illustrates that the scope and agenda for ethics in technology to a large extent depend on how technology is conceptualized. The last few decades has witnessed a variety of conceptualizations of technology that move beyond the view of technology as a neutral tool or a historical necessity. This study has undertaken to see technology as a political, social, cultural, professional, and cognitive activity. The development in the last decades has seen changes in trends, one of which is a move away from technological determinism and the assumption that technology develops autonomously to an emphasis on choices in technological selection. The other is a distancing from ethical reflection on technology in general to the consideration of ethics within specific technologies and specific phases in the development of technology. Trends of this kind have resulted in an enormous increase in ethical questions related to technology. These developments also imply that the ethics of technology is to be empirically informed, not only about the exact consequences of specific technologies but also about the actions of engineers and the process of technological development.

In the last decades, much attention has been paid not only to ethical issues that arise from the use of a technology, but also during its design phase. One thought is that technologies in their planning are still malleable in their social effects while, once produced and in use, the negative social consequences of technologies may be harder to avoid and positive effects harder to achieve. Although the design phase is regularly identified as an ethically relevant phase of technological development, there is remarkably little in-depth research on ethics in design. One reason might be that many studies in ICT-ethics tend to focus on disasters and the fallacious choices made involving ethical considerations. Ethical issues in design are often more subtle, not to mention more challenging to recognize. However, in addition to its role as a cognitive process, design is also a social process in which different groups and individuals are involved and in which negotiation plays an important role. The social nature of design raises a range of ethical issues such as who is to be involved in the design process, or how are decisions to be made in a morally acceptable way.

Evidently, technology alone cannot solve the world's problems. Instead, technology will be an increasingly important tool in advancing well-being and in accelerating the pace of social and economic development. It is important to involve innovative minds from industry, with their creativity and assets of technical experience. These instances will be vital part to developing new technologies and systems, or adapting existing ones, to meet the pressing needs and challenges of all communities. The technology industry must connect the world intensively and bridge the digital divide by bringing the benefits of technology to all. Therefore, in the spirit of content-based reference frame, the following

question must be asked: Would the direction of technological development be different if different values directed the design of new technologies?

6.3 Authors Contribution

The research presented in Articles I-III, discussing the new approach to values, was planned in collaboration with Pertti Saariluoma. Through extensive correspondence, the author of this study participated both in planning the empirical approach, as well as reporting the results. Saariluoma contributed significantly in applying a content-based approach to the data accumulated. In the Article II, Pertti Jokivuori collaborated by offering his knowledge of statistical analysis.

The author of this dissertation collaborated in the research and writing of Articles IV-V, though the actual PeopleNet concept was developed by Saariluoma. Article VI represents a compilation of views shared equally by authors who explore critically the issues of Information Society. The idea for conceptual analysis of disinformation, presented in the Article VII, was Saariluoma's, although the author contributed by elucidating the issue of varying roles and attitudes among information providers and users. The author also introduced into the study a discussion of philosophical views on intentionality and intentional action.

6.4 Future Research

Since a content-based approach is cross-disciplinary in nature, the approach may have contributions to make in various fields of research when applied to examining values in HTI design. Nonetheless, content-based investigations, particularly in the context of experiencing values, relate to other content-based examinations that have traditionally focused on skills, like engineering and architectural design (Saariluoma & Maarttola, 2003a, 2003b; Nevala 2005). Within the earlier studies, task type examinations are applied. Evidently, content-based examination of experiencing values requires task type experiments that may have similar features between task types. Because of the highly abstract nature of value concepts, the investigation of how concepts are interpreted and how people experience values can bring new perspectives for content-based investigations. It should be remembered that an individual's values are in complex relationship to personal emotions, ideals, ethics, and aspirations, and to social, cultural, and historical context. Therefore, examinations focusing on, for instance, interactions between emotions and cognition in the context of values may enrich the understanding of human thinking and human information processing generally.

For the previously described examination, protocol analysis provides a rigorous methodology for eliciting verbal reports of thought sequences as valid

sources of data. In protocol analysis, the central assumption is that it possible to instruct subjects to verbalize their thoughts in a way that does not alter the series of thoughts mediating the conclusion of a given task. Therefore, it can be accepted as valid data on thinking. Based on theoretical analysis, Ericsson and Simon (1984/1996) argued that the closest connection between thinking and verbal reports is found when subjects verbalize thoughts generated during task completion. When subjects are asked to think aloud, some of their verbalizations seem to correspond to vocalizing 'inner speech', which would otherwise have remained inaudible. Non-verbal thoughts can also often be given verbal expression by brief labels and referents.

Protocol analysis has emerged as one of the principal methods for studying thinking in Cognitive Psychology (Crutcher, 1994), Cognitive Science (Simon & Kaplan, 1989), and Behaviour Analysis (Austin & Delaney 1998). As further evidence of its validity, protocol analysis now plays a central role in applied settings, such as in the design of surveys and interviews (Sudman, Bradburn & Schwartz, 1996) and user testing of computer software (Henderson, Smith, Podd & Varela-Alvarez, 1995). Finally, several interesting adaptations of verbal-report methodology are emerging in the study of text comprehension (Pressley & Afflerbach, 1995) and education (Renkl, 1997). Generally, in the examination of values, a content-based approach framework together with protocol analysis as a methodological tool are flexible in that individual variations, as well as general abstractions, adapt in scope.

When applied to examination of human values, the notions of apperception, restructuring, reflection, and construction, which are promoted within a content-based approach, emphasises the understanding of individuals as active producers of meanings. Through the previous concepts, the problems of conflicting interpretations or conceptions of values, for example, within the work community, can be approached. From this viewpoint, content-based approach works as a mean in meta-theoretical discussions in cross-disciplinary value studies. For example, there are possibilities for interactions between content-based approach and ethics. In philosophical ethics, there is plenty of literature about the issues of ethical problem-solving, wherein values are naturally involved (conflicts of values, or rights, or professional responsibilities). It is not possible to discuss thoroughly all the themes that are relevant in these fields. Therefore, broad themes like theoretical philosophy's discussion of ethical experience or interpretation are not profoundly investigated in this dissertation. In the future, however, these themes related to content-based examination of experiencing values should be studied in more detailed ways. How philosophical and empirical approaches to issues of experiencing values can be imported into contact with each other in way that the results benefit both fields should also be investigated further.

The content-based approach to values presented in this dissertation may have contributions to ICT-ethics as well. More systematic understanding of the manners in which individuals' perceptual abilities interact with their earlier personal experiences can be utilized, for example, as part of future engineers'

education, to further their awareness of the cognitive mechanisms that are directing their design decisions. Therefore, a systematic study of relationships between the conceptual contents that the individual tends to use in decision-making situations can offer new perspectives for educational purposes. From this perspective, it is important to understand how conceptual content elements affect selection processes in design and other decision making situations.

One important task in future research is to deepen the theoretical frame of content-based analysis by both experimental examinations and conceptual analysis, and specifically in the context of value studies, to develop relevant measure methods that are in accordance with a content-based approach. In studies of mental contents of individuals interpreting their values, the data collected in experimental situations are crucial, since such data reveal the instantaneous process of thinking. Naturally, experimental situations may limit the freedom of construction of participants' interpretations. Another limitation is that the conceptual contents of values construct and reconstruct during a long time period, which constitutes a major difficulty for building an experimental situation with high validity. Despite certain limitations, more comprehensive understanding of experiencing values is possible by creating different experimental settings and combining the results of various data types. Qualitative data can reveal those individual differences that may appear in human experience of values, whereas quantitative analysis can provide a general view of the typical features of the data. In this dissertation, the differences in conceptual contents of valuations are pointed out between individuals with different levels of expertise and different positions in the organization. In the future, conceptual differences of values between individuals from different cultures, and from different domains of expertise should be studied. However, even if education partly directs an individual's experience of values, the personal aspects may play the most crucial role in guiding thoughts and emotions related to values.

A content-based reference frame can also be applied to investigating the changing conceptions of values during different periods of time. Through analysis of written documents, which can vary from newspaper writings to national information society vision 'manifests', the conceptions of values and conscious manipulation of values and attitudes of the audience can be investigated. By analysing the conceptions presented in such documents by different instances, it is possible to become more conscious of the contents of human experience of values. With systematic conceptual analysis, the intuitive aspects of human values can be recognised. After all, the significance of a content-based approach to experiencing values derives from the notion that better understanding mental processes that direct the perception of values and interacts with emotions should be reached. In many cases, values tend to be emotionally charged, both as concepts and in human experiences. From an individual's perspective, they are constantly present, affecting one's actions quite holistically, but values and value-related information are also all around in an individual's external reality. Therefore, in the future, it is important to extend the scope of a content-based

approach to cover more widely the sphere of narrative and visual surroundings, as well as products that are present in people's everyday lives.

YHTEENVETO (FINNISH SUMMARY)

**Ihmisen ja teknologian vuorovaikutussuunnittelun arvoulottuvuudet
- sisältöperustainen lähestymistapa arvoihin**

Arvojen merkitys inhimillistä toimintaa ohjaavana periaatteena on yleisesti hyväksytty tosiasia. Eri tieteenalat ovat lähestyneet arvoja käsittämällä ne hierarkkisesti rakentuneeksi järjestelmäksi, joka liittyy läheisesti ihmisten asenteisiin ja motivaatioon. Arvojen rakentumista ohjaavat kognitiiviset prosessit ja niihin liittyvät merkityksen muodostumisen mekanismit ovat jääneet kuitenkin vähemmälle huomiolle. Arvotutkimuksessa käytetty teoreettinen kieli on myös ongelmallinen puhuttaessa arvojen rakentumisen prosesseista, koska tätä rakentumista ohjaavia kognitiivisia prosesseja ei ole otettu riittävästi huomioon.

Tässä tutkimuksessa arvoja käsitellään sisältöperustaisen lähestymistavan kautta. Tällä tavoin voidaan käyttäytymistä selittää objekteihin liittyvien mentaalisten representaatioiden informaatiosisältöjen kautta, sekä tavoittaa niitä kognitiivisia prosesseja, joiden kautta mentaaliset representaatiot rakentuvat. Tutkimuksessa arvoja tarkastellaan mentaalisina representaatioina; kohteen ja siihen liitettyjen käsitteiden avulla. Kohteen mentaalisen representaation informaatiosisällön rakentumisprosessia tarkastellaan ensin hyödyntäen apperseption käsitettä, minkä jälkeen käsitellään representaatioelementtejä ja niiden välisiä suhteita. Arvot osoitetaan tässä yhteydessä olemukseltaan abstrakteiksi kohteiksi, ja niihin liittyvien mentaalisten representaatioiden keskeisimmiksi elementeiksi määritellään käsitteet, joiden kautta arvoihin liittyvät merkitykset muodostuvat. Arvojen mentaalisille representaatioille on tyypillistä, että niiden käsitteelliset sisällöt ovat implisiittisiä (non-perceivable), vastakohtana havaintoihin perustuville eksplisiittisille (perceivable) sisällöille, joilla on jokin yksiselitteinen visuaalinen kohde. Implisiittiset sisällöt perustuvat puolestaan subjektin aikaisempaan kokemukseen.

Tutkimuksessa arvoista keskustellaan HTI-suunnittelun kontekstissa, mikä liittää tutkimuksen osaksi ICT-etiikan aluetta. Tämän pohjalta voidaan osoittaa, että teknologia ei ole arvovapaata, vaan arvot ovat kiinteä osa suunnitteluprosesseja. Tutkimuksen empiirinen osa perustuu kahteen kyselyyn, jotka tehtiin suunnittelualalla toimiville henkilöille. Kyselyjen avulla selvitettiin arvojen välisiä suhteita ja niiden koettua tärkeyttä toimintaa ohjaavina periaatteina.

Otoksien sisällä pystyttiin erottelemaan käsitteellisiin sisältöihin perustuvia arvo-orientaatioita, sekä havaitsemaan, että eri arvo-orientaatiot ennustavat henkilön suhtautumista yrityksen yhteiskuntavastuuseen. Lisäksi havaittiin, että orientaatiot ovat erillisiä mentaalisia malleja suhteessa arviointeihin, joita henkilöt tekivät itse omasta ammatillisesta pätevyydestään. Tulokseksi saatiin myös havainto, jonka mukaan henkilön asema organisaatiossa oli arvojen koettuun tärkeyteen vaikuttava muuttuja.

Empiiristä osiota raportoivien artikkelien lisäksi tutkimukseen on sisällytetty neljä artikkelia, jotka edustavat esimerkkejä arvojen filosofisesta, praktisesta ja sosio-kulttuurisesta ulottuvuudesta. Arvot ovat keskeisiä inhimillistä toi-

mintaa ohjaavia periaatteita, minkä vuoksi yleisenä johtopäätöksenä voidaan esittää, että arvojen käsitteelliset sisällöt ovat määräävässä asemassa siinä, minkälaisena toimintana esimerkiksi päätöksentekotilanteessa arvot aktualisoituvat.

Huolimatta siitä, että sisältöperustaisen analyysitavan soveltaminen arvotutkimukseen on tässä yhteydessä toteutettu perinteisiä arvotutkimuksen menetelmiä käyttäen, soveltuu lähestymistapa hyvin myös tutkimukseen, jossa kiinnostuksen kohteena ovat arvot tulkintaprosessina ja kokemuksena. Kyselyt, joissa arvokäsitteet ovat valmiiksi tutkijan määrittelemiä, on riittämätön lähtökohta tämänkaltaiselle tutkimukselle. Tulkintaprosessia pitäisi sen sijaan tutkia kokeellisesti prosessin eri vaiheiden, kuten restrukturoinnin, reflektion ja konstruoinnin kautta. Tarkentamalla teoreettista kieltä näiden käsitteiden avulla, voidaan arvojen merkityksen problematiikkaa jäsentää mielekkäällä tavalla. Tämä edellyttää systemaattista kokeellista tutkimusta, jossa teoreettisten käsitteiden selitysvoimaa testataan. Sisältöperustaista lähestymistapaa soveltavassa arvotutkimuksessa tulisi huomiota kiinnittää myös arvoihin liittyviin tunnekokemuksiin sekä arvojen merkityksenmuodostusta ohjaavaan apperseptioprosessiin.

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