

**Value of Information Systems and Products:
Understanding the Users' Perspective and Values**

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Abstract

Developers aim at providing value through their systems and products. However, value is not financial only, but depends on usage and users' perceptions of value. In this paper, we clarify the concept of value from the users' perspective and the role of user involvement in providing value. First, theories and approaches of psychology, marketing and human-computer interaction are reviewed. Secondly, the concept of 'user values' is suggested to clarify the concept of value from the user's point of view and a category framework of user values is presented to make them more concrete and easier to identify. Thirdly, the activities and methods for adopting user values in development work are discussed. The analysis of the literature shows that value has been considered in multiple ways in development. However, users' perspectives have received less attention. As a conclusion, we draw future research directions for value-centered design and propose that user involvement is essential in identifying user values, interpreting the practical meaning of the values and implementing them in development work.

Keywords: value, perceived value, user values, worth-centred design, value-centred design, value-sensitive design, user-centred design, user involvement

Contribution: This paper provides a literature review on the concepts of value from the users' perspective. The paper a) reviews and combines theories and approaches of psychology, marketing and human-computer interaction, b) shows the limitations of existing approaches, c) develops a conceptual framework on user values, and d) provides agenda for future research.

The results imply that providing value with systems and products is a core goal in development work, but the concept of value is multidimensional and its evaluation depends on the perspective

used. Users have an essential role in value realization as their attitudes and actions determine if the system or product is accepted and used effectively.

This article provides a conceptual framework for understanding the dimensions of user values. This framework is useful in developing methods for identifying user values and utilizing them in development work for providing attractive, acceptable and valuable information technology to users. This research is expected to be interesting to researchers and developers in general and researchers focusing on user-centered design, value-sensitive design, or value-centered design.

Introduction

As Hirschheim and Klein (1989) point out, all system developers approach the development task with a number of explicit and implicit assumptions about the nature of human organizations, the nature of design task, and what is expected of the developers. One of the most critical assumptions relates to *what is seen as valuable in information systems*.

Companies are most often interested in measuring the business value of the investments, but also other perspectives on value have become popular. For example, Cronk and Fitzgerald (1999) describe how the research focusing on business value has proceeded from using only a financial perspective towards organizational performance and other perspectives. This has happened after the recognition of the difficulty of isolating IS's contribution from other organizational and external confounding factors. Thus, Cronk and Fitzgerald (1999) propose the three dimensions of IS business value to be: 1) system-dependent dimension, 2) user-dependent dimension, and 3) business-dependent dimension. The user-dependent dimension describes the value that is added to the organization as a result of user characteristics. User characteristics include skills and attitudes that may result in effective or ineffective use of the system. Thus, users are recognized as an essential dimension in value creation.

In addition, the value of the information system can be evaluated from different stakeholders' point of views. Usually, the manager's and system provider's points of views are the most influential. For example, Bannister (2001) observes that the perspectives of the provider and the consumer or citizen are different in the evaluation of the public sector information systems, but that the consumers' perspective is easily overlooked and replaced with the provider's perspective of the value.

Value-based software engineering strives towards making value considerations explicit throughout software engineering and optimizing decisions to meet explicit objectives of the involved stakeholders, from marketing staff and business analysts to developers, architects, and quality experts, and from process and measurements experts to project managers and executives (Biffi, Aurum, Boehm, Erdogmus, and Grünbacher 2006, p. IX). Users are seen as one stakeholder group and user involvement and negotiations are seen as approaches for identifying their win conditions.

There is also a clear and growing focus on value-centered design in a fairly recent development in human-computer interaction. Cockton (2004ab, 2005) introduces a development framework for value-centered design where the focus is on the value of the product for users. Later, Cockton (2006) selects 'worth' as being a less loaded term than 'value' and starts to refer to 'value-centred design' as 'worth-centred development' (WCD). He states that WCD focuses on development of the worthwhile, that is, things that will be valued, as manifested in people's motivation to invest time, money, energy or commitment. Furthermore, he states that design quality is evidenced by the *lasting value of enduring outcomes*.

In summary, the value of the information system or product is a multidimensional concept. As Bannister (2001) points out, traditionally, interest in IT value has been focused on cost savings and productivity. However, users can be seen as important stakeholders in development and value creation and the focus of this paper is on value from the user's point of view. The value of the information system or product is usually formed by users' actions and thus their perceptions of the system's or product's value are critical. For example, Jurison (2000) concluded, based on his longitudinal study, that those applications that are perceived to offer high value from the start are adopted rapidly and those applications perceived to be low value are adopted slowly and are unlikely to gain acceptance in the long run.

The users' perspective means that value is not only considered from financial point of view as the system or product may be important and meaningful to the user for multiple reasons. Thus, to understand the users' perspective to value, it is essential to identify what is important to them and what motivates them to use the system or product. In psychology, values are conceptions of desirable ways of behaving or desirable end states – for example, friendship, respect for tradition, living healthily, and ambition. The same conceptual framework is used here

as a starting point for understanding and identifying what kind of purpose, functions and characteristics are important to users in a certain usage context.

In this paper, we clarify the concept of value from the users' perspective and the role of user involvement in providing value to users. First, theories of psychology, marketing, management science, and human-computer interaction are reviewed. Secondly, a concept of 'user values' is suggested to clarify the concept of value from the user's point of view and its links to human behavior and system/product use. Thirdly, a category framework of user values is presented to make them more concrete and easier to identify. Fourthly, this article outlines the role of value in user-centered design and finally draws conclusions and future research directions.

Values in psychology

Psychology considers human beings and their needs from many points of view (Carlson, Martin, and Buskist 2007). For example, biological needs such as hunger and thirst are identified as one category of motivation, a driving force that moves a person to a particular action. Social needs are associated with the relationship of oneself and others: e.g., attachment and need for social respect. In addition, personality is also one of the main approaches to explain differences in behavior. Furthermore, motivational psychology has focused on individual values and their role in predicting behavior.

In psychology, values are seen as conceptions of desirable ways of behaving or desirable end states – for example, friendship, respect for tradition, living healthily, ambition (Verplanken and Holland 2002). In addition, values have defined to be cognitive representations of needs (Schwartz and Bilsky 1987) and desirable trans-situational goals (Schwartz 1994). Values are characterized as relatively stable individual preferences that reflect socialization; it is suggested that they may be conceived as a type of personality disposition (Bilsky and Schwartz 1994). Thus, as Verplanken and Holland (2002) point out, values are culturally shared, but individuals differ in how they rank the importance of specific values, while values may themselves be an important part of a person's self-concept. On the other hand, it is known that people make trade-offs while making everyday decisions. For instance, a person who values honesty might be creative in filling out his or her tax form. Verplanken and Holland (2002) suggest that honesty might not be a sufficiently central value for this person. He or she might not interpret a tax return

situation as one in which honesty applies as a value, or he or she might enact a competing value (e.g., materialism).

However, the concepts of needs, values, motivations, and their interrelations are not unambiguous in psychology. For example, Jolibert and Baumgartner (1997) point out in their review that sometimes values and motivations are defined as equivalent, but the same equivalency is observed also for the relationship between values and needs. Bilsky and Schwartz (1994) describe *values to reflect socialization* (e.g. learning) and Alderfer (1972, p. 7) defines *needs to be innate*. In contrast to others, Maslow (1970) states that human motivation is based on a hierarchy of needs and he names both innate and learned preferences as needs.

According to Maslow's (1970) hierarchy, the basic needs are physiological needs, including the need for food and so on. Until these needs are met, a person cannot be motivated by the upper levels of needs. The levels are described in Table 1. At the highest level, when all other needs are satisfied, we are free to pursue self-actualization.

Table 1. The hierarchy of needs according to Maslow (1970).

Self-actualization	To achieve one's full potential
Aesthetic needs	Harmony, order, beauty
Cognitive needs	Curiosity, exploration, understanding of world
Esteem needs	To be competent and recognized
Attachment needs	To love and to be loved, to have friends
Safety needs	Security, comfort, freedom from fear
Physiological needs	Food, water, oxygen, rest

Maslow's theory is often criticized as it suggests a rather rigid order of needs. Alderfer (1972) thus suggests ERG theory in which both satisfaction and lack of satisfaction affects the strength of the need. The letters ERG stand for three levels of needs: existence (material and physiological), relatedness (relationships with significant other people), and growth (self-actualization). As the theory was formed and empirically tested in work settings, it also includes considerations of the tendency of persons to desire the satisfaction of more concrete needs as a consequence of being unable to obtain less concrete needs. Thus, a person may want material rewards when his relatedness needs are not satisfied.

Schwartz (1992) developed a comprehensive model of values in which ten different types of values are distinguished: power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity, and security. Each value type contains a number of single values. The value categories has been shown to be valid in 21 countries (Schwartz 1992) and achievement, self-direction, stimulation, tradition, conformity and security values are shown to correlate with affective well-being (Sagiv and Schwartz 2000).

Oulasvirta and Blom (2007) review modern theory of motivation and list basic human needs related to personalization. The listed needs are very similar to Schwartz's (1992) classic value categories, but they also include the more materialistic needs 'physical thriving' and 'money-luxury' according to Sheldon, Elliot, Kim and Kasser (2001).

Allen and Ng (1999) suggests that psychological values shape users' evaluation of products in two ways. First, users are evaluating a product's *utilitarian meaning* and making a piecemeal, attribute-by-attribute judgment. Second, users are evaluating a product's *symbolic meaning* with an *affective, intuitive and holistic judgment*. Using questionnaires and statistical analysis Allen and Ng (1999) and Allen (2001) show a connection between psychological values and product preference and it seems to depend on individual preferences and product type which of the two judgment ways is more influential.

In summary, psychology offers tools for understanding human motivation and values. The distinction between needs and values are not clear; both terms refer to goals and motivations (Jolibert and Baumgartner 1997). However, needs can be seen related to physiology (e.g. hunger) or lower level goal achievement (e.g. need to move from a place to another) and values to be cognitive representations of needs (e.g. wisdom, success). Thus, values are personal representations of goals that are important and appropriate to maintain in the long run. An individual's interpretation of the relative importance of certain values depends on the culture and socio-economic status of the person (Flanagan, Howe, and Nissenbaum 2005) and a practical context (Verplanken and Holland 2002).

Value in marketing and management sciences

In marketing sciences, value has originally been observed mainly from the perspective of the expected or delivered benefits and commercial product value to customers (Kotler 1999). In

addition, customer values have been considered in the literature focusing on customer value perceptions and in various consumer segmentation models.

The concept of *customer perceived value* (see Pura 2005 for an excellent review) refers to the value that customers perceive they receive or experience by using the offering (Bettman, Luce, and Payne 1998). It is known that customer value perceptions reliably predict purchase behavior (Bettman, Luce, and Payne 1998). However, it is recognized that *customers may perceive value differently, based on their personal values, needs, preferences and financial resources* (Ravald and Grönroos 1996). In addition, it is recognized that value perceptions may differ according to usage situation (Anckar and D’Incau 2002). Thus, effective marketing is also seen to require a good knowledge of the underlying needs and value perceptions of the specific user segments (Pura 2005).

Customers’ values have been considered in consumer psychology. For example, Sheth, Newman, and Gross (1991) have created an extensive framework of consumer values. The framework includes five value dimensions: functional, social, emotional, epistemic and conditional. Functional value represents value derived from effective task fulfillment. Social value relates to social approval and the enhancement of self-image among other individuals. Emotional value is acquired when a product arouses feelings or affective states. Epistemic value relates to the experience of curiosity, novelty or gained knowledge. Conditional value refers to situational circumstances that impact choice.

In addition, consumer segmentation models have been developed to describe consumers’ demographics, behavior and psychographics, and more recently, values. For example, the VALS (VALS 2006) framework provides a questionnaire tool for assessment of individual consumers into values-related segments. The segments have descriptive names such as Believers, Achievers or Experiencers. In addition, Hirschman and Holbrook (1982) differentiate consumers, based on their motives. They describe consumers as either problem solvers or seekers of fun and enjoyment, and thus refer to utilitarian vs. hedonic consumption. The segmentation models are used in optimizing the marketing of product and service offerings to the target markets. However, with the lack of concrete linkage of the segment descriptions – including the user values – to the product requirements, the usage of the segmentation models in the detailed design of a system or product is less evident.

Customer perceived value is clearly an essential concept in marketing. In addition, analyzing consumers' values is useful in trying to understand lifestyles and needs of different consumer segments. Applying a broader scope, values can be used to predict or explain the acceptance and attractiveness of new systems or products in organizations or by masses of consumers. However, as Boztepe (2007a) points out, the segment groupings created by analyzing values can help in the general positioning of a product, but they fall short in helping developers to identify necessary design details of the product for a particular context of use.

HCI and value in design

Value has received research interest also in the context of human-computer interaction and design during recent years. In this section, some of the main approaches to value and design are reviewed and the roles of the value concept that they adapt are discussed. At the end, the activities and methods used to integrate values to practical design work are summarized.

Participatory design

Participatory or co-operative design is an approach of Scandinavian origin (Floyd, Mehl, Reisin, Schmidt, and Wolf 1989; Ehn 1993). Developing workplace democracy and the development of workers' competence and power to influence their work and their workplaces were the driving forces of the work (Ehn 1993). Thus, participatory design is one of the first approaches that have a clear value statement for design work. The value was seen to be achieved through users' active participation in design work, usually inside one organization.

Scandinavian originated user participation may be the tightest level of involvement, as users are usually participating in the actual development work inside the development organization. Participation is associated with many benefits such as "early user buy-in into the system" (El Emam and Madhavji 1995).

However, users and developers co-operate with each other and users participate in decision making. Thus, it is clear that not all users can participate in decision making and individual users may even have conflicting values and preferences. In addition, strict user participation may not be possible in product development where there is no one organization or

discrete set of users (cf. Karlsson, Dahlstedt, Natt och Dag, Regnell, and Persson 2002) and there is an increasing number of users (Grudin and Pruitt 2002; Iivari and Iivari 2006). For example, based on experiences reported in the literature Grudin and Pruitt (2002) suggest that transferring user participation to product development has led to lost of:

- 1) Long-term engagement, and the empathy, commitment and deep understanding that such engagement can bring with particular participants.
- 2) Attention to the sociopolitical and ‘quality of life’ issues, including values, fears, aspirations and so forth.

Thus, in product development contexts, user involvement is more transitory and users’ preferences and value considerations may not be evident in short discussions.

Value-sensitive design

A value-sensitive design (VSD) approach emerged to integrate ethics and design (Friedman 1996, 1997; Friedman and Kahn 2002). Thus, the point of view to values is slightly different from the psychological one. For example, Friedman and Kahn (2002) and Friedman, Kahn, and Borning (2006) list values such as human well-being, human dignity, justice, human rights, fairness, accountability, privacy, and support for the democratic process. Thus, the main focus is not on individual users’ psychological values (e.g. hedonism) but on values with ethical or social importance.

Value-sensitive design seeks to design technology that accounts for human values throughout the design process and it is influenced by participatory design experiences (Friedman 1997). Freedom from bias in computer systems is one of the concrete goals identified by Friedman and Nissenbaum (1996). They use the term *bias* to refer to computer systems that systematically and unfairly discriminate against certain individuals or groups of individuals in favor of others.

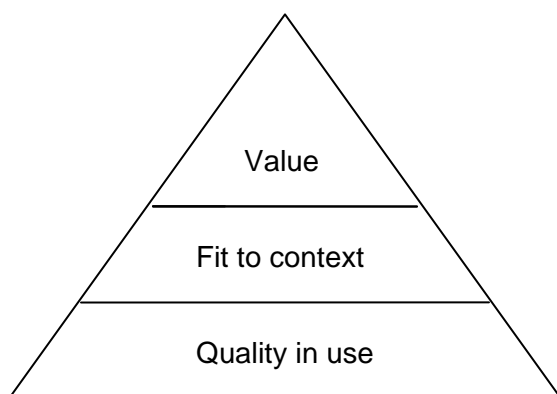
According to Friedman and Kahn (2002), the idea behind the approach is that such values have moral justification independent of whether a particular person or group upholds the values. On the other hand, they recognize that the emergence of the values can vary in a particular culture at a particular point in time. The basic idea is that there are universal moral constructs that should be carefully analyzed and that only the specific behaviors or rigid moral rules tend to have cross-cultural variation (Friedman and Kahn 2002, p. 1196).

The moral values are related to preserving the vitality, piece and harmony of human communities and finally the well-being of individuals. Thus, the considerations of value-sensitive design provide an important viewpoint from which to design systems and are likely to also have also financial implications for product development companies.

On the other hand, value-sensitive design faces a diversity of values. Nowadays, western culture no more represents uniform values but pluralistic values, and in cross-cultural design, developers face even more varied sets of values (Gould 2005). In addition, the high-level needs are to be concretized in technical design and the means of implementing the values may have several competing channels. Furthermore, some of the identified human values such as privacy are highly context dependent. Thus, values may be conflicting and incorporating them into design is difficult. This can be seen, for example, in Volda and Mynatt's (2005) case study, in which they gathered data on the values of families.

Value-centred design

Gilbert Cockton (2004ab) started to discuss the goals of HCI and speak for value-centred design (VCD). His main argument is that quality in use and fit to context is not enough, but HCI should be broadened to include the concept of value as an ultimate goal of design. According to him, these goals are dependent on each other: the most important goal is to achieve value, but the problems in achieving lower level goals degrade and destroy value (see Figure 1 for illustration of this).



Figure

1. The goals of the HCI, adapted from Cockton (2004a).

Cockton (2004a) does not define the concept of value, but he states that artifacts should deliver value in the world, while later, Cockton (2004b, 2006) talks about “intended value” and “intended value of a product or service”, referring to product value that is a concept commonly used in marketing. However, Cockton (2006) later explains that *value* should not be understood only in commercial or moral terms and he defines it to mean *worthwhile*, something that will be valued, as manifested in people’s motivation to invest time, money, energy and commitment. Furthermore, Cockton (2006) argues that the value of enduring outcomes of interactions is more important than qualities experienced during interactions and describes the goal as a “happy ending” in terms of system impact.

Thus, to avoid wrong associations and connotations, Cockton (2006) changes VCD to *worth-centred* design (WCD), which focuses on development of the *worthwhile*. Later, Cockton (2008) describes worth as being the balance of benefits over costs. VCD or WCD developed by Cockton (2005, 2006), adds new activities and artifacts to existing development methodologies in order to identify, design and evaluate value or worth.

User experience

The concept of user experience was developed in the early 2000’s to extend the viewpoint of usability with notions of users’ emotional and contextual needs, and the impact of users’ previous experiences to current experiences. User experience takes a broader view to users’ in-depth needs and motivations. For example, Jordan (2000) states that user experience includes not just functionality and usability but also pleasure and pride. Mäkelä and Fulton Suri (2001) state that user experience is a “result of motivated action in certain contexts”. The user’s previous experiences and expectations influence the present experience, and the present experience leads to more experiences and modified expectations”. Thus, the total user experience is a continuum that takes shape as a result of a series of smaller user experience units.

Forlizzi and Ford (2000) include users’ values as one influencing factor in user experience. Other user-related factors in this model are users’ emotions, cognitive models, and prior experiences. Product-related factors are features, usefulness and aesthetic quality. The user-product interaction is affected by context of use as well as social and cultural factors.

Similarly, Jääskö and Mattelmäki (2003) identify personal motivation, attitudes and values having influence in the user experience among other factors. They consider product meaning and personal motivation to be more tacit aspects of user experience that are not easily recognized or communicated to design, or even directly affected by design.

In their review of user experience (UX) research directions, Hassenzahl and Tractinsky (2006) emphasize the importance of *hedonic* aspects of HCI of interactive products alongside the pragmatic aspects. They argue that the “non-instrumental aspects” of products such as aesthetics and beauty will impact user acceptance, valuation and choice, and that the current models of UX need to be enriched to create a more complete, holistic HCI.

User experience can be viewed as an extended viewpoint to HCI and usability. User experience furthermore looks at the long-term relationship of the user with the product and the associated services. The above-mentioned models indicate that user experience is inherently affected by the set of user values and motivations as one of the factors affecting the eventual user acceptance or rejection of the system or product use.

User values

As a summary of the previous section, participatory design focuses on the worker’s point of view; value-sensitive design of universal moral values and value-centred design focus on the intended worth of the product. In addition, the concept of *perceived value* is used in marketing and *values* in psychology. However, user values are not so explicitly considered in the reviewed literature. Thus, we first clarify the concept of value from the user’s point of view and, next, we identify categories of user values.

The concepts of value and values

Figure 2 is our suggested way of clarifying the confusing concepts and their relations in a development context. As Cockton (2006) refers to value as ‘happy endings’ in terms of system/product impact, the perceived value of the product is the final goal of the development work. However, the perceived value is not located in system/product properties but arises as a consequence of users’ perception and experience of system/product. As Boztepe (2007b) points out, value is the practical or symbolic result that is created through user-product interaction.

Thus, value does not automatically arise from product properties, but it depends on the interaction of the user and the product in a particular context. In addition, the user brings her/his psychological values, needs, and goals to that interaction. Thus, the resulting perceived value depends also on what is important and valuable to the user.

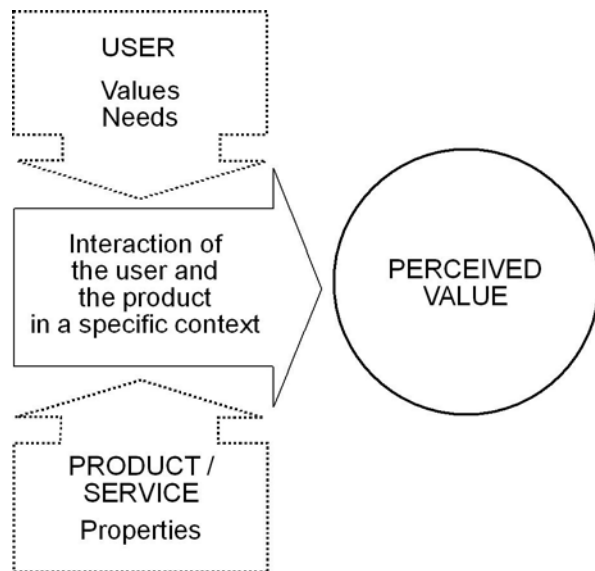


Figure 2. The relations of product/system properties, user values and perceived value.

If we consider the literature on value in design, the main focus has been on the end result as worth or perceived value. Users' psychological values are often mentioned as an influential factor (e.g. Jääskö and Mattelmäki 2003), but values are not thoroughly considered, even though they play an important role in the development of perceived value. We could argue that a product or system does not have any absolute value, but the value of it depends on the person who perceives it and the psychological values the person has. The psychological values we could regard as user values in order to capture the user's point of view in perceived value.

As a conclusion, we propose the term '*user values*' to describe *users' psychological values that affect their views as to what kind of purpose, functions and characteristics are important to them in a certain usage situation and context*. Thus, user values are users' internal conceptions of what is important in a certain usage context and they are not perceptions of products. The term *human values* could be continued to be used to describe moral values, as is the case in value-sensitive design (Friedman and Kahn 2002). Understanding user values provides valuable information in designing products and systems. Psychology and marketing

provide a good theoretical starting point for understanding values and these fields also provide tools for identifying values.

In summary, we have tried to make a distinction between the concepts of value and values. As Cockton (2006) describes the use of the terms in British and American English is confusing. He suggests that the ‘worth’ is better umbrella term covering both users’ motivations and product motivators such as quality. However, in order to clarify the concept of value from users’ perspective, we suggest that the plural form ‘user values’ is used for users’ motivations as it is done in psychology, and the singular form ‘value’ is used for the perceived value of the product or system. “Worth”, in Cockton’s (2008) words, means the relations of value (benefits) and costs.

Category framework of user values

User values can be seen to be many-faceted. The variety of values identified in the literature review is listed in Table 2. The categories give an overview of the psychological values that can be involved in perceiving products and their value. Thus, the categories are mostly based on psychological literature (e.g. Alderfer 1972; Maslow 1970; Rokeach 1973; Schwartz 1992) or consumer psychological literature (e.g. Sheth, Newman, and Gross 1991). Contrary to others, Maslow (1970) defies values as being needs, thus, here also Maslow’s needs are called values.

All these values exist without any products and a product can support one or more of these values (see also Boztepe 2007b). Thus, the developed category framework can be used to describe users’ preferences towards products, as shown by product benefits examples in Table 2. In a similar vein, developers could probably brainstorm and specify features for their products after the user values are identified or test which values the products are supporting.

Table 2. A category framework of user values.

Category of values	Description	Product benefit examples
Social values (Alderfer 1972; Maslow 1970, Sheth et al. 1991)	Relatedness, social, and external esteem, status, power, control and dominance, achievement, conformity, equality, helpfulness, honesty and loyalty	Increase in social associations between family or other social groups, increase in respect, influence, power, social achievement and conformity, e.g. in communication or task management
Emotional/hedonistic values (Holbrook 2005; Schwartz 1992; Sheth et al. 1991)	Aroused feelings or affective states, pleasure, fun, sensory enjoyment	Features arousing positive feelings, pleasure and enjoyment, increase in emotional experiences, support in handling experiences and emotions and saving emotional occasions; e.g. mobile TV
Stimulation and epistemic values (Schwartz 1992; Sheth et al. 1991)	Excitement, experienced curiosity, novelty and gained knowledge	Increase in excitement; e.g. in adventure gaming
Growth and self-actualization values (Alderfer 1972; Maslow 1970; Rokeach 1973, Schwartz 1992)	Self-actualization, creating, independent thought and action	Support in creating new things and achieving internal esteem; e.g. a multimedia authoring system; personal web site creation
Traditional values (Schwartz 1992)	Respect, commitment, and acceptance of the customs and ideas that traditional culture or religion impose on the self	Support in users' tasks in maintaining their customs and ideas; e.g. traditional industrial design of product appearance; religious content
Safety values (Maslow 1970; Schwartz 1992)	Security, social order, healthy, comfort, freedom from fear	Protection and alarms, ease of use, familiarity of functions and appearance; e.g. mobile communication or surveillance
Universal values (Schwartz 1992)	Understanding, appreciation, tolerance, and protection for the welfare of all people and for nature	Ecological soundness, improving equality; e.g. recyclability of products; flea market web sites; donation web sites

In addition to user values, there are perceived value categories that express more closely the relations to the product properties. Pura (2005) mentions monetary and convenience value categories in her review. In monetary value, the product is seen as a means for fulfilling tasks to derive monetary value. For example, a person saves money by using the product or the cost-benefit ratio of the product is superior compared with the alternatives. Convenience value gives a person ease and speed for achieving a task effectively and conveniently. In addition, Sheth, Newman, and Gross (1991) mention conditional value, which means that value arises only in a

specific context or situation. For example, people usually buy Christmas cards only during the season.

In summary, the presented category framework of user values makes user values more concrete and easier to identify. The framework can be used in developing methods for identifying user motivations and utilizing them in development work for providing attractive, acceptable and valuable information technology to users.

Activities and methods for designing value

Current level of understanding of user values in product development process

Product development can be divided into consecutive phases, such as concept development, system design, detailed design, testing and refinement, production and ramp-up and product launch (Ulrich and Eppinger 1995). According to the principles of parallel and integrated marketing and product development processes (Rothwell 1994), the marketing should be present in each stage of product development. This implies that the marketing-based target segment definitions and descriptions should guide each phase of product development.

In practical product development, target user definitions are often at the level of very basic user characteristics, such as age, sex, profession (e.g. technical or non-technical) and study background. Such target user descriptions do not help designers develop insights into identifying the in-depth product needs or what users value in technology. Even though the traditional “waterfall model” is often replaced with a more iterative development process, it is still a common practice to encapsulate the understanding of users into a list of requirements. With such an approach, the linkage of users’ in-depth needs, motivations and values to the product features may often not be explicit. Thus, the designers who eventually make the detailed design decisions may not have an in-depth understanding of the values of the users’ of their product.

Activities and methods

The different approaches to values in design do not have established activities and methods for identifying user values and integrating them to practical design work. For example, Jääskö and Mattelmäki (2003) do focus on user experience but merely mention that probes are useful for identifying users’ subjective thoughts, motivations and feelings. However, some early propositions have been tested and case studies carried out. The suggested activities and methods

are summarized in Table 3. It can be seen that most of the activities are similar regardless of the study and its approach to values. Identifying values, implementing them in design work and evaluating the success of implementation can be identified as the essential activities. In addition, Flanagan, Howe, and Nissenbaum (2005) and Friedman, Kahn, and Borning (2006) observe that the values of different user groups or stakeholders may be conflicting and the conflicts need to be solved. Thus, Friedman, Kahn, and Borning (2006, p. 362-363) suggest that first, different stakeholders and the benefits and harms for each stakeholder group need to be identified and, then, the corresponding human values (with ethical emphasis) are recognized and mapped to benefits and harms.

The proposed activities and methods provide a good starting point for considering values in design. However, the existing methods are often based on observing users' reactions to existing designs. For example, Jordan (1998) describes the valuation method that involves asking users how much extra they would pay for new features.

However, the methods like this may never expose users' real values and new opportunities to provide value for them. On the other hand, it is not easy for developers to discuss values with users and users may not even recognize their own values. For example, people often rationalize that they buy a mobile phone for safety reasons, but the underlying value may be improving their social status. For product development purposes, we need both efficient and easy-to-use methods to identify latent user values. Thus, we need to develop the proposed methods further and compare their effectiveness.

Table 3. A summary of the activities and methods of designing value.

	Activities	Methods
<i>Cockton (2005, 2006)</i>	Identifying opportunity Design Value impact assessment Iteration	Ethnography, interviews, competitor analysis, personas, cultural models Prototyping, worth delivery scenarios Value impact analysis assesses the impact of user difficulties on achieved value. Causal analysis, design change recommendation and implementation
<i>Flanagan et al. (2005)</i>	Discovering values Identifying values-based conflicts Implementation and prototyping Verifying values	Creating a working list of values from sources including: Explicitly stated project goals, the hypotheses generated by the team to achieve goals, prior empirical work, related technical systems, design environment, design team, prototyping and user testing Checking functional components for values conflicts Working through values conflicts generated in specific functional components, clarification of values and design elements Prototyping and gathering feedback Checking if the desired project values are embedded in the project and other are not
<i>Voida and Mynatt (2005)</i>	Gathering values data Generating value inferences	Cultural probes The Rokeach Value Survey Brainstorming and clustering
<i>Friedman, Kahn & Borning (2006)</i>	Identifying direct and indirect stakeholders Identifying benefits and harms for each stakeholder group Mapping benefits and harms onto corresponding values Conceptual investigation of values Identifying value conflicts Integrating value considerations into organizational structure	Personas, semi-structured interviews A table of human values (with ethical emphasis) Literature
<i>Biffle et al. (2006), Boehm (2003)</i>	Benefits realization analysis Stakeholder value proposition elicitation and reconciliation	Results Chain to visualize the chain of realizing potential benefits Prototypes, scenarios, and stories Negotiation and prioritization Visualization and trade-off analysis

	Business case analysis Continuous risk and opportunity management Concurrent system and software engineering Value-based monitoring and control	techniques
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Summary and conclusions

In this article, we have discussed the literature and considered the concept of value from the users' perspective. The analysis of the literature shows that value and worth have been considered in multiple ways in development. However, user's perspectives have received less attention. We clarify the concept of value by separating the perceived value of products from user values. User values affect users' perception and experience of the product and its value.

The concept of user values makes the motivational aspect of system/product usage visible to developers. The values represent both users' preferences as to what is important to them and aversions to what they want to avoid. In addition to considering users' practical context-related goals and needs, it is necessary to understand user values to develop products acceptable and attractive from the user's point of view. To make the user values easier to conceive, we developed a framework describing the potential varieties of values identified in the literature. The category framework of user values makes the concept more concrete and user values easier to identify.

Table 4 summarizes the goals of the reviewed design approaches and their relations to values and user involvement. In the user experience approach, user values are seen as one of the many influencing factors, and thus the approach is not included in the table. Participatory design does not focus on user values, but it argues for solid participation of workers and an understanding of their needs. The principal values are based on the ideas of participatory design, as the values are self-evidently seen in democracy, the development of workers' competence and power to influence their work (Ehn 1993). On the other hand, as the idea is that users are

participating in development work and that they are given power, they have the possibility of guiding the development work according to their values.

Value-sensitive design clearly states that it is reaching for universal moral values, but it is unclear how these values are reached. As the values are seen as universal, value-sensitive design does not actively promote user involvement. For example, according to Friedman and Kahn (2002), the idea behind the approach is that values have moral justification independent of whether a particular person or group upholds the values. Later, Friedman, Kahn, and Borning (2006) suggest that a semi-structured interview is useful to understand users' judgments about a context of use, and existing technology, or a proposed design.

Table 4. Summary of the design approaches.

	Participatory design	Value-sensitive design	Value-centered design	Value-based software engineering
Goal of the approach	Workplace democracy	Integrating moral values and design	Worthwhile systems	Meeting objectives of the stakeholders, mostly business value
Values advocated	Workers'	Universal moral	Users' and developers'	Stakeholders' win conditions, ethical considerations in engineering practice
User involvement type	Participatory	Consultative	Consultative	Participatory/negotiation

Cockton's (2005, 2006) value-centered design is a rather neutral approach, the goal being a "happy ending" in terms of system impact. It can be interpreted based on Cockton's texts (2005, 2006) that user values are identified by ethnography and interviewing users themselves, and then developers have an active role in defining the product value. On the other hand, value-based software engineering is focusing on stakeholders' win conditions and it is thus focusing on the practical utility point of view.

In summary, the reviewed design approaches consider values from different points of views, but stances towards user involvement vary. We hope that our conceptual work on user values emphasizes the user's point of view and the importance of involving the user. It is

observed in several case studies that users and developers may have different preferences and values and user involvement may help developers to understand user values (Olsson 2004; Kujala 2008). As developers are in direct contact with users, they can see the motivations and values of users and the differences from their own values through their own eyes. Thus, it is easier for developers to form insights about users' preferences and make good design decisions from the user's point of view.

The HCI-literature already provides the most essential value-centered product development activities and some methods have already been suggested and piloted (see Table 2). In addition, value-based software engineering (Biffel, Aurum, Boehm, Erdogmus, and Grünbacher 2006) also considers users' roles, particularly in situations where it is possible to enable users to participate and to negotiate with them in workshops. However, this approach is not suitable to all situations. For example, in product development contexts, users' motivations may be varied and too implicit to be negotiated (cf. Jääskö and Mattelmäki 2003).

In addition, there are still many open questions. First, the value-based product solutions seem to be highly context dependent; the importance of context of use is already recognized in user-centered design. For example, the values valid in selecting a washing machine for home would probably be at least partly different from selecting a publicly used personal mobile phone. Secondly, as Hoyer and MacInnis (2007) point out, people do not usually think about their values and may therefore have difficulties in verbally stating them. In psychology, it is very well known that some values are unconscious or socially not desirable to mention. In addition, developers' perceptions may be biased, as they view system/product goals and user preferences through their own set of values and assumptions. Thus, developers need tools to discover user values and preferences and utilize them in practical product development.

Furthermore, the value discussion reverts to the question as to on whose terms products are developed. They may be developed on the terms of developers, for example, or on those of the paying customer or of the actual end-user. In order to really consider the user's point of view, users should be able to direct the focus of the future product and not just react to existing designs. Furthermore, even if the user values were known in the early phases of development, still the interpretation of the meaning of user values is value-loaded. As Friedman (1997) points out, we can say that any human activity reflects human values. Thus, we argue that user

involvement is essential in identifying user values, interpreting the practical meaning of the values and implementing the values in products.

Agenda for future research

As discussed earlier, the users' role in actively defining their own values for product development is still underrated in current approaches to values in design. We believe that the concept of *user values* will enable making the motivational aspect of system/product usage more visible for developers. However, user values are not explicit and easy to discuss and developers need concrete tools for communicating with users, identifying their values and interpreting this information for practical product development work.

In our future research, we intend to approach this topic by conducting several case studies with consumer product development companies in order to create an empirical basis for the developers' requirements for value tools. Using this approach, we will form prototypes of these tools and pilot them in real product development projects. Our overall objective is to create a "user values toolbox" for developers of new technology products. Using these tools throughout the product development and marketing process would support the creation of acceptable and desirable products for future users.

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