

# **A SET OF CRITICAL HEURISTICS FOR VALUE SENSITIVE DESIGNERS AND USERS OF PERSUASIVE SYSTEMS**

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## **Abstract**

*This paper proposes a set of critical questions to guide reflections on persuasive systems. The questions are mainly based on value-based practical reasoning as suggested in argumentation research. Value based reasoning is involved in any persuasive design discourse to assess the purposiveness, goodness or rightness of system actions to be designed. In this approach, the critical questions are structured according to practical discourses suggested by Habermas (1993) in order to help focusing on, and guiding, pragmatic, ethical, and moral discourses of persuasive system design and use. This paper contributes to the current research by enriching reflective methods with a set of concrete questions which can in particular be employed for a value sensitive participatory design of persuasive systems. This article is conceptual-theoretical by its nature. It illustrates the applicability of the approach by employing it to analyze a commercial web-based persuasive system.*

*Keywords: Critical questions, critical design, value-based practical reasoning, discourse ethics, motivation, value sensitive design, user participation*

# 1 Introduction

Persuasive Systems are designed to change a person's attitude or behaviour or both, without using coercion or deception (Fogg, 2003). For example, *Amazon.com* persuades people to purchase more books or other products whereas *Classmates.com* persuades people to provide personal information. The web, mobile, and other ambient technologies created opportunities for persuasive interaction for several motives, including persuading people to behave in socially-valued ways (e.g. save energy, quit smoking), by giving information, providing feedback, and taking over actions. Previous literature has suggested some principles and guidelines for designing and evaluating persuasive systems (e.g., Fogg, 2003, 2009; Oinas-Kukkonen & Harjumaa, 2009). In addition, explicit attention has been paid to ethical aspects, in particular with respect to the motives of the designer, the methods of persuasion employed in the system, and the intended and unintended outcomes of the persuasion (e.g., Berdichevsky & Neuenschwander, 1999; Fogg, 2003, Verbeek, 2006). These valuable suggestions of concepts and principles can guide designers and help to minimize harmful consequences. Yet, there are some open issues and challenges, which have been only partly addressed within the discourse of the persuasive systems research community. Two of them are of particular importance for the purpose of this paper.

First, the principles and guidelines are mainly designer-centred and concerned with reflections in the design time of a persuasive system, expecting from design teams to reflect and anticipate future use situations and consequences of persuasion. For example, two principles proposed by Berdichevsky and Neuenschwander (1999) state (1) that creators of technology should not seek to persuade others of something they would not be persuaded of themselves and (b) that the creators of persuasive technology must anticipate and assume responsibility for all "reasonably predictable" outcomes. These principles are in line with Kant's Categorical Imperative that expects from an individual (e.g. a designer) to reason about the universalizability of his or her maxims, while suggesting what to do. In contrast, Habermas (1993, 1996) argued in his work on discourse ethics that the diversity of interest and value orientations requires the involvement of all those affected in a decision for what is good or acceptable for them. In fact, user-centred approaches to persuasive systems are concerned with the involvement of users, yet, mainly for the evaluation of usability and persuasive effectiveness and not for addressing ethical issues. An exception is the work of Davis (2009, 2010), arguing for the participatory and value sensitive design methods to account for the ethical implications of persuasive systems. From the perspective of discourse ethics, such a participatory approach is promising while it would actively engage all stakeholders in the design process, involve reflection on the stakeholders' values and negotiations, and thus promote social learning. However, the current literature on persuasive system design lacks specific guidance on how to structure the participatory process to deal with ethical issues, that is, to allow a systematic way to reflect on what is good or bad about the motives, methods and outcomes of the persuasion. More precisely: What questions should or could be asked in design discourses to deal with the diversity of values, goals, and methods?

Second, involving stakeholders in a participatory design process is helpful (Klein & Hirschheim, 1994; Chatterjee et al., 2009), yet it does not guarantee the effectiveness and appropriateness of a persuasive system in future use situations, since participants of the design process cannot anticipate or envision all future use situations or evaluate the consequences and acceptability of actions for all. This is partly due to the practical constraints such as the limits of participants involved, the available design knowledge, emerging users and use contexts, as well as value changes. Hence, approaches to persuasive systems require methods for involving end users (e.g. non-participants of design process) in use time, in order to enable them to articulate unmet needs, to criticize and change recommended actions, goals and underlying values set by the participants of the design time, when they are viewed as inefficient, inappropriate or unethical (Yetim, 2010, 2011b).

In fact, in the field of Information Systems (IS), proposals for both problems mentioned exist, even though they have not been applied to persuasive systems yet. Based on Habermas's works, several

participatory and discursive methods have been suggested to involve those affected in design to deal with the diversity of values and norms (e.g., Klein & Hirschheim, 2004; Yetim, 2006, 2011b; Mingers & Walsham, 2010). Moreover, a discourse support tool has been developed, which provides a set of critical questions and discourses for enabling continuous discourse in design and use time (e.g., Yetim, 2008). When integrated in the user interface of a persuasive system, the tool would allow to critically assess the comprehensibility of communicated signs, the efficiency, effectiveness, and appropriateness of recommended actions or persuasion strategies, goals, and outcomes. Nevertheless, many of the issues suggested by discursive approaches are abstract, and there is a need for more fine-grained questions, in order to provide designers and users of persuasive systems with a set of discourse-specific critical heuristics.

To support reasoning about persuasive systems, this paper proposes a rich set of critical questions which are mainly based on the concept of value-based practical reasoning as considered in argumentation research (Atkinson et al., 2006; Walton et al., 2008). An interesting aspect of considering argumentation is that it clarifies different assumptions behind an argument and also provides a list of critical questions to challenge them. Value based reasoning is involved in any persuasive design discourse to reflect on purposiveness, goodness or rightness of system actions to be designed. Habermas's (1993) three practical discourses focus on these general issues to address them in an argumentative way. Therefore, the approach uses the practical discourses to structure the richer set of critical questions derived from a value-based argumentation. As a result this paper provides value sensitive designers and users with a list of critical questions which can be used as heuristics in design discourses as well as in use time to reflect and challenge the implicit or explicit value assumptions, goals or actions of a system. This paper contributes to the current research by enriching current reflective or discursive methods with a set of concrete questions which can be useful for the value sensitive participatory design of persuasive systems. This article is conceptual-theoretical by its nature. Yet, it illustrates the applicability of the proposed framework by employing it to analyze a commercial web-based persuasive system.

In the following, we will first describe the theoretical foundations, then present the proposed framework for critical heuristics, and finally, illustrate its application with the help of an example.

## 2 Theoretical Foundations

### 2.1 Practical Reasoning and Practical Discourses

Practical reason is the general human capacity for resolving, through reflection, the question of what one is to do (<http://plato.stanford.edu>). In contrast to theoretical reason, which deals with the truth of propositions, practical reason is concerned with the desirability or value of actions. In practical reasoning people assess and weigh their reasons for and against alternative courses of action.

In his discourse ethics, Habermas (1993) distinguishes between pragmatic, ethical and moral employments of practical reason and three types of practical discourses, i.e., pragmatic, ethical and moral discourses. The idea is that in practical situations the question of what one is to do can take on pragmatic, ethical, and moral meaning, requiring different kinds of answers for justifying choices among alternative available courses of action. This question can have a pragmatic task in view (e.g., designing a persuasive interface), and reflections in *pragmatic discourse* seek reasons for a rational choice of means in the light of fixed goals, or of rational assessments of goals in the light of existing value preferences. When values underlying the goals or actions themselves become problematic, the question of what one is to do points beyond the purposive rationality and requires value decisions in *ethical discourse*. This discourse involves reflections on the self-understanding of a person or a community, i.e., on what is good for one self or for a cultural community. Finally, in case of value conflicts between cultural communities, the question of what one is to do calls for a reflection in *moral discourses* to seek what is "equally good for all", that is, a moral discourse seeks justice for all through the generalization across conflicting societal or cultural interests and value orientations.

The relevance of discourse ethics to IS research has already been articulated (e.g., Yetim, 2006; Mingers & Walsham 2010). Based on Habermas's works, Yetim (2006) suggested a complex discourse model consisting of many other discourse types and he also implemented them in a discourse support tool (Yetim, 2008). In fact, all these discourses are relevant for the design of persuasive systems and can promote reflections on different issues in a systematic way. Yet, this paper focuses on three practical discourses which deal with ethical aspects and the justification of choices of values, goals, and actions. The discourses will serve as a general framework for seeking the choice of the purposive (pragmatic), the good (ethical) and the just (moral). Each of these discourses can involve other sub issues and arguments. The approach proposed is based on the assumption that providing explicit support by means of critical questions is better than leaving them implicit. One of the useful sources for finding fine grained critical questions to support the deliberation in these discourses is the research on argumentation, in particular, the research on argument schemes and value-based practical reasoning.

## 2.2 Argumentation Schemes and Value-Based Practical Reasoning

Walton et al. (2008) regard practical reasoning as a species of presumptive argument. For example, the simplest form of practical reasoning is the means-end reasoning which is an argument with two premises and a conclusion of the form: "*I have a goal G. Carrying out this action A is a means to realize G. Therefore, I ought (practically speaking) to carry out this action A*". Given an argument like this, we have a presumptive reason for performing the action. This presumption can be challenged. Subjecting the arguments to appropriate challenges allows us to consider the alternatives and to determine the best choice for us. Walton et al. (2008) describes a set of other forms of reasoning such as the argument from consequences and the argument from values. These forms of reasoning are called argumentation schemes. Each argument scheme captures a stereotypical pattern of human reasoning and is associated with a set of critical questions. The basic method of analyzing and evaluating an argument is to use the critical questions associated with the argument scheme.

Design discourses of persuasive systems can involve different forms of arguments, including an argument from consequences or an argument from values, since the assessment of persuasion goals, methods, or intended and unintended outcomes of a specific design features as good or bad involves value judgments. Thus value-based argumentation is of particular relevance here. How it works and relates to practical reasoning is well explained in (Atkinson et al., 2006, Walton et al., 2008). In particular they show that arguments from values can be combined with practical reasoning to build an argumentation scheme that is called value-based practical reasoning. There are two different but interrelated suggestions for the scheme and associated critical questions, as summarized in Table 1.

Atkinson et al. (2006) critically reviewed an earlier work of D. Walton, who had five critical questions, and suggested an elaborated set of sixteen critical questions. The recent scheme described in Walton et al. (2008) involves seven critical questions. In contrast to Walton et al., Atkinson et al. employ an argument scheme which makes the factual context explicit. Nevertheless, the critical questions are interrelated and some of them are reformulations or variants. One important difference concerns the fact that Atkinson et al. (2006) distinguish between three elements: states, goals and values. In their model they define *states* to be a set of propositions about the world to which we can assign a truth value, *goals* are propositional formulae on this set of propositions, and *values* are functions on goals. The distinction between goals and states allows representing the difference between effects of actions which the agent wishes to attain, and the effects which follow from an action but are not necessarily desired by the agent. They view values as being distinct from goals and not just sub or super goals. Values provide the actual reasons for which an agent wishes to achieve a goal. Two people may agree upon a goal to be achieved, but their reasons may be very different due to their contrasting value sets. In a persuasion dialog, the questions provide different ways to attack the goals, the proposal of an action for each goal, or the values promoted. For example, concerning the schema used by Atkinson et al., (2006), the proponent can question the premises (i.e., the four statements of the general scheme) (#1 - #4), explore alternative ways to satisfy the same desired value

(#5 - #7), consider the side effects of the action (#8 - #10) and the interference with other actions (#11) as well as explore the possibility of an element of the scheme (#12-16).

In the following section, we explore the relation of these questions to practical discourses.

<b>Scheme used by Walton et al. (2008)</b>	<b>Scheme used by Atkinson et al. (2006)</b>
<p><i>Premise 1:</i> I have a goal G.  <i>Premise 2:</i> G is supported by my set of values, V.  <i>Premise 3:</i> Bringing about A is necessary (or sufficient) for me to bring about G.  <i>Conclusion:</i> Therefore, I should (practically ought to) bring about A.</p>	<p>In the circumstances R  we should perform action A  to achieve new circumstances S  which will realise some goal G  which will promote some value V.</p>
<p><b>Critical questions:</b></p> <ol style="list-style-type: none"> <li>1. What other goals do I have that might conflict with G?</li> <li>2. How well is G supported by (or at least consistent with) my values V?</li> <li>3. What alternative actions to my bringing about A that would also bring about G should be considered?</li> <li>4. Among bringing about A and these alternative actions, which is arguably the best of the whole set, in light of considerations of efficiency in bringing about G?</li> <li>5. Among bringing about A and these alternative actions, which is arguably the best of the whole set, in light of my values V?</li> <li>6. What grounds are there for arguing that it is practically possible for me to bring about A?</li> <li>7. What consequences of my bringing about A that might have even greater negative value than the positive value of G should be taken into account?</li> </ol>	<p><b>Critical questions:</b></p> <ol style="list-style-type: none"> <li>1. Are the believed circumstances R true?</li> <li>2. Has the action A the stated consequences S?</li> <li>3. Will the action A bring about the desired goal G?</li> <li>4. Does goal G realise the value intended?</li> <li>5. Are there alternative ways of realising the same consequences?</li> <li>6. Are there alternative ways of realising the same goal?</li> <li>7. Are there alternative ways of promoting the same value?</li> <li>8. Does doing action A have a side effect which demotes the value V?</li> <li>9. Does doing action A have a side effect which demotes some other value?</li> <li>10. Would doing action A promote some other value?</li> <li>11. Does doing action A preclude some other action which would promote some other value?</li> <li>12. Is it possible to do action A?</li> <li>13. Are the believed circumstances R possible?</li> <li>14. Is the situation S believed by agent <i>a</i> to result from doing action A a possible state of affairs?</li> <li>15. Are the particular aspects of situation S represented by G possible?</li> <li>16. Is the value proposed is indeed a legitimate value?</li> </ol>

Table 1. Value-based practical reasoning scheme and critical questions

### 3 A Framework for Critical Heuristics

Using three practical discourses as a general structure we will discuss in this section how the critical questions from Table 1 can be regrouped according to the purposes of three discourses and mapped to them, in order to support critical reflections within each discourse.

For mapping the questions, we have first considered the main concerns of each discourse (i.e., the purposive, the good, and the just) and eliminated from Table 1 those questions suggested by Atkinson et al. (2006) that refer to whether a state of affairs exists (i.e., #1, #13, #14, #15). These questions require other types of sub-dialogues such as the theoretical discourses or empirical investigations in the discourse model (Yetim, 2006). Second, we identified a similarity between both lists of critical questions and either used one of them or renamed them (e.g., #3 and #6 suggested by Walton et al., considered similar to #6 #12 suggested by Atkinson et al.). Third, we have also added some other questions suggested by Yetim (2006, 2008), in particular for dealing with moral aspects. Finally, we considered two different usage purposes for each discourse to further differentiate between questions and to build subcategories within each discourse. Each discourse can involve discussions for finding the best solutions (i.e., identifying what is purposive, good, or just) or for critically assessing the conformance of a decision with previously agreed values or norms (i.e., testing whether something is purposive, good, or just). Following Habermas (1996), Yetim (2006, 2011b) argued that design discourses involve iterations between three discourses and the results of pragmatic discourse should be compatible with values accepted in ethical discourse, and the results of both pragmatic and ethical discourses should not violate moral norms agreed upon. Therefore, for grouping the critical questions in each discourse, we distinguish between the *identifying mode* for creatively finding new ideas, values or norms, and the *checking mode* for testing the conformance of the results.

Table 2 presents the arrangement of critical questions in each discourse. Pragmatic discourse includes questions that deal with the identifying and checking of goals in relation to desired or legitimated values and of actions in relation to both goals and values. In this discourse participants may first check whether the value is a legitimate value, that is, agreed upon in an ethical discourse where the reflection on and the choice of values takes place. Then, they may propose alternative ways to satisfy the desired value, check whether a chosen action or goal is in accord with the desired value, reflect on side effects of the action, the interference with other actions, etc. Alternatively, they may start with setting goals and actions, without making the underlying values explicit. When value issues and conflicts emerge during a dialogue, then participants can enter ethical discourses. The basic pragmatic or purposive questions about the best ways to achieve particular goals may be more complex than described here. The resolution of conflicts may require information, expertise, and other resources.

An ethical discourse involves questions to identify values by reflecting on and rationally choosing value preferences as well as assessing whether the result of the pragmatic discourse (i.e., the choice of goals and action) are in line with the values preferred, i.e., whether doing the action is in accord with one's values or existential identity and self-understanding. Accordingly, actors may first start with an ethical discourse to identify values worth considering in design and then enter into a pragmatic discourse to discuss how to realize them. Alternatively, they may enter an ethical discourse after the pragmatic discourse to resolve value conflicts or to check results of the pragmatic discourse. Ethical reflections on values may not lead to a consensus or several values may be worth promoting, so that there may be a need of preference ordering.

Moral discourse includes questions that help to identify the norm in case of value conflicts and critically assess the conformance of the results of the pragmatic and ethical discourse with accepted norms. The identification of the norm or regulation that is just or good for all requires the suggestion of regulation/norm and reflection on the consequences of the suggested norms for the value orientation of those affected by the norm. The critical questions help to guide the moral reflection and to shift the process of moral reflection from the individual designer to all relevant stakeholders.

Discourse types	Questions
Pragmatic Discourse	<p>For both <i>Identifying &amp; Checking</i></p> <p><i>Goal-Value</i></p> <ol style="list-style-type: none"> <li>1. Is the value proposed indeed a legitimate value?</li> <li>2. How well is G supported by (or at least consistent with) the value?</li> <li>3. Are there other goals considered that might conflict with G?</li> <li>4. Are there alternative goals to promote the same value</li> </ol> <p><i>Action-Goal</i></p> <ol style="list-style-type: none"> <li>5. Is it possible to do action A?</li> <li>6. Will the action A bring about the desired goal G?</li> <li>7. Are there alternative ways of realizing the same goal?</li> </ol> <p><i>Action-Value</i></p> <ol style="list-style-type: none"> <li>8. Does doing action A have a side effect which demotes the value intended?</li> <li>9. Does doing action A have a side effect which demotes some other value?</li> <li>10. Does doing action A preclude some other action which would promote some other value?</li> </ol>
Ethical Discourse	<p><i>Identifying</i></p> <ol style="list-style-type: none"> <li>11. How is value V understood/defined?</li> <li>12. Is value V worth promoting?</li> <li>13. Are there other values that conflict with value V?</li> </ol> <p><i>Checking</i></p> <ol style="list-style-type: none"> <li>14. Do the goals considered promote or violate values preferred?</li> <li>15. Do the actions considered promote or violate values preferred?</li> </ol>
Moral Discourse	<p><i>Identifying</i></p> <ol style="list-style-type: none"> <li>16. Has a norm/regulation negative consequences for my (our) value orientation?</li> <li>17. Is a diverse regulation good for all (or just)?</li> <li>18. Are there alternative ways of regulation (norm) that could be good for all given value conflicts?</li> </ol> <p><i>Checking</i></p> <ol style="list-style-type: none"> <li>19. Are the values promoted in accord with norms?</li> <li>20. Are the goals to be achieved in accord with norms?</li> <li>21. Are the actions to be taken in accord with norms?</li> </ol>

Table 2. *Practical discourses and related critical questions*

Before closing this section, we should note that the answers to each question may lead to disagreements such as disagreements about the assumed link between goals and values, about the appropriateness of actions and goals, about the effects of actions, about the conformance of actions with values and norms etc., which require a resolution. In addition, the resolution of some questions such as the comprehensibility of actions or factual disagreements may require other discourse types. Moreover, the questions suggested in this paper are not meant to be complete. Design deliberations

involve also other forms of arguments and there are other critical issues, as described in (Walton et al., 2008), as well as other types of discourses, as described in (Yetim, 2006)

## 4 The Applicability of the Framework

There are different options to apply the framework. One option is *the discursive use of it in design discourses*, in which participants can employ the critical questions to evaluate the arguments or positions of others. The design decisions resulting from such discourses can also be documented and communicated along the critical questions, that is, in a template that justifies choices of values, goals, and actions and serves as a document for value-focused design rationale. This would allow for a transparent and rational communication in the design process in general, and in the design process of persuasive systems, in particular. Even though design participants may not have satisfying answers to each question in design discourses, having the explicit list may create an awareness of important aspects and enforce participants to think about them. In fact, there are several discourse support tools that allow mapping such questions for using them in design meetings (see for example, tools described in Conklin, 2005; Yetim, 2008).

Another option is to use the set of critical issues for the analytical evaluation of any system designed, of the user interface of a system or design documents. This can be done in a discursive (in teams) or extra-discursive way such as an evaluation by an individual expert or the feedback of an individual user during the use. In this section, we will demonstrate the applicability of the suggested framework through the extra-discursive evaluation of a contemporary commercial system, namely, The Nike+ system (<http://nikerunning.nike.com>). The Nike+ system supports the organization and participation of the running activities and incorporates several distinct persuasive techniques in its functionality. This system is chosen because it has been also used by other authors (Oinas-Kukkonen & Harjumaa, 2009) to illustrate the feasibility of a conceptual model for the design and evaluation of persuasive systems. It is, therefore, of particular interest to see how the same system responds to our issues which have not been considered in the previous research so far.

With respect to pragmatic aspects, we can critically evaluate whether the system clearly communicates goals and also provides reasons for why the goals are considered as good, in order to motivate users to achieve the goals. In addition, we may critically ask whether the system clearly communicates what to do to achieve the goals and also explains why a proposed action is better than other available actions.



Figure 1. Showing goals and explaining the value of achieving the goal.

As shown in Figure 1 (left), the Nike+ system offers users different options which have been categorized according to the runner's goals, e.g., "run more often," "run farther," "burn calories," "run faster," or "set coach program." Moreover, the system also motivates users by making the value of the achievement of each goal explicit, i.e., it provides reasons for why achieving the goal is good. This is activated when a user hovers the cursor over a goal, for example, over the goal "burn calories", as shown in figure 1 (right). The system makes the value of this goal explicit by stating "Sweat off a few pounds by setting this goal."

Certainly, values can be good reason for motivation. If users do not consider the value worth promoting, the goal will be less motivating. Moreover, users may not agree that the achievement of the goal would realize the stated value. Further critical questions can be asked such as how the goal is achieved, i.e., what should be done, which is explained in the detailed descriptions of the goals.

What is important here is the issue of whether the system allows users to provide a feedback or to challenge the values. As shown in Figure 2 (left), the computer-human dialogue is supported by a feedback mechanism, a feedback panel, which users can activate to provide ideas, questions, describe problems and articulate what they liked or valued. In addition the system offers a forum for discussions. Moreover, the user can evaluate the whole running program using personalized feedback, as shown in Figure 2 (right). These mechanisms enable users to articulate which actions were good or bad. In this way they may influence the choice of values, goals, and actions.

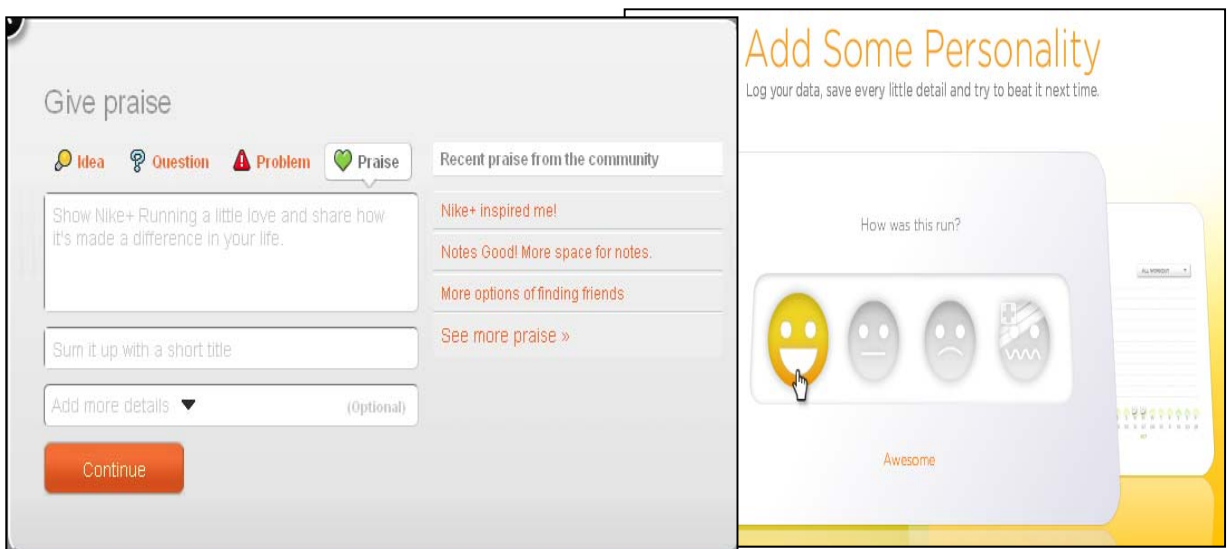


Figure 2. Enabling users to provide feedback on what they do or do not value.

With respect to the moral questions, i.e., the right norm, there is no other mechanism than the aforementioned feedback mechanism or forum to be used. As the forum does not restrict the kinds of questions to be asked, users can use the forum to ask pragmatic, ethical, and moral questions as well as to articulate their values and the consequences of actions for their own value orientations.

All in all, the analytical evaluation of this system demonstrates the practicability of the theoretical framework of critical questions, which allows us to claim that they are useful for improving the persuasive qualities of the systems.

## 5 Conclusion

Previous literature has already emphasized that the success of persuasive systems depends on the integration of sound technology, effective persuasive principles and careful attention to ethical considerations. This paper suggested a set of critical questions that can be used both in design

discourses as well as in use situations to critically assess the values, goals, and actions of a system. The illustration of the applicability of the framework by means of a persuasive system indicates that the suggested concepts can be useful and enrich the repertoire of concepts suggested in previous research to guide the design and evaluation of persuasive systems.

The suggested questions by no means cover all the useful questions that one can ask to improve the persuasive qualities of a system. Future research can investigate additional questions for promoting reflections in the context of persuasive system design. In addition, experimental work will be needed to demonstrate the framework's applicability in various real-life design and usage situations. It is of particular interest to investigate whether differentiating issues along the discourse will be practical or whether the discourses can be organized as workshops in a participatory design to involve different types of participants in different discourses. For example, design experts may participate in a pragmatic discourse whereas all those affected can articulate their values or moral understanding in an ethical and moral discourse.

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