

Taking Universal Perspective in Design: A Plea for two Reflective Principles and Mechanisms

Fahri Yetim
University of Siegen, Germany
fahri.yetim@uni-siegen.de

Abstract

Current approaches to the design of interactive systems emphasize openness, dynamic behavior, and evolution of the system. There is also a growing interest in accounting for human values and norms. This paper takes a universal perspective informed by discourse ethics and it argues that value and norm issues cannot be fully resolved in the design process and that they require the continuous participation of users in use time. On the other hand, the increasing complexity in global contexts necessitates exploiting machine intelligence to adapt the system behavior to the interaction context. This paper comments on two complementary reflective principles for interactive systems (i.e., the meta-adaptation and meta-communication principles) and argues that both principles need to be implemented as system's features to support computer's as well as users' reflections.

1. Introduction

User-centered design approaches encompass processes and techniques to identify the complete range of user requirements, including special needs, skills, preferences, or any other user characteristics [12, 16, 36]. Many approaches regard a system as an evolving artifact and emphasize that the design process does not end with the delivery of the system to a community of users. Instead, the process of design continues as people use and adapt the system [13]. Therefore, developers of *adaptable systems* are concerned with appropriate openness within the system and with ensuring that it lends itself to these adaptations in use time [e.g., 17, 28, 45]. In contrast, approaches to *adaptive systems* aim to provide users with a system that is able to adapt its behavior to the user's needs, goals, interests, and to the context [5]. Developers of such systems anticipate possible conditions of future use situations and implement methods and techniques to enable the system to react to these situations dynamically.

Each of the design paradigms involves a set of design principles that collectively define the overarching approach. Design principles play a significant role, as their application in design process shapes the characteristics of the resultant system [25]. For example, the principle that states "the system should adapt its communication to its users" legitimizes a system component for collecting data about the users. Yet, one of the challenges of human-centered design approaches is to deal with competing principles and paradoxical issues. To mention just two:

- *Diversity-Unity Paradox*: On the one hand, principles that value diversity (i.e., "diversity is good") support the creation of more heterogeneous rules and conventions of interactions to accommodate to user diversity. On the other hand, calls for standardization aim to overcome problems and complexities that are viewed as a result of heterogeneities (i.e., "diversity is bad"). Consult [49, 50] for a discussion.
- *Personalization-Privacy Paradox*: On the one hand, personalization techniques are needed for tailoring the interaction to individuals based on knowledge about their preferences and behaviors [26]. On the other hand, personalization requires the users to give some of their personal information to their service provider, which raises privacy concerns and creates a "personalization-privacy paradox" [4, 38]. These challenges increase when adaptation is oriented towards groups of diverse members [24].

In other words, designing for making systems usable for every single user is difficult enough, but designing for enabling interactions among users with diverse background, interests or ethical values is a far greater challenge.

This paper focuses on the design challenges at the level of design principles. It assumes that design principles provide recommendations/prescriptions in terms of "what should we do" and that they may be more or less rational for global interaction contexts [46]. Following Habermas [20], the question of "what should we do" can take on a pragmatic, an ethical, or a

moral meaning depending on how the problem is conceived. By taking such a broad perspective, this paper seeks to provide suggestions to the following challenging issues:

1. What should we do to reduce the technological complexity and help people in interacting with and through systems to achieve their goals in an efficient way?
2. What should we do to address ethical-moral challenges in global contexts appropriately?

To address these challenges, this paper argues for two complementary design principles: *meta-adaptation* and *meta-communication principles*. Whereas the former aims to help dealing with the complexity of technological options, the latter is required to facilitate human communication and mutual understanding in order to overcome the socio-technical gap between what is socially desirable and what is technologically possible [1]. Viewing design as an open and continuous process, this paper suggests that reflective mechanisms driven from the two principles should be implemented in the designed artifact in order to enable continuous reflection and change during the use time. Being theoretical in nature, this paper provides arguments in support of this position and does not prescribe how to build or evaluate the mechanism.

The paper is organized as follows: Firstly, section 2 briefly introduces what we mean by “taking universal perspective” and discusses some challenges and design implications. Section 3 justifies the need for two complementary principles, describes challenges to which they are responding, and also mentions some examples of emerging applications of these principles. Finally, section 4 discusses the implications of this research and offers some conclusions.

2. Taking a universal perspective

2.1. Some general assumptions

The adjective “universal” is used in many design research streams, including universal usability, universal access, universal design, universal actability [39, 49]. By “taking universal perspective”, we mean acknowledging heterogeneities at the technological, cognitive and social levels, and dealing with them “appropriately” when designing interactive systems.

The relationship between human and system components is viewed as dynamic and interdependent. In other words, when a user/sender communicates with others, the effectiveness of his or her communication is not only dependent on his/her personal ability but also on that of the mediating system and of the receiver(s). Similarly, taking the system’s perspective, the effectiveness of a system depends on the

complementary abilities of the interacting actors. The design goal is to achieve a ‘dynamic fit’ between human and system components in their co-orientation. Accordingly, acting successfully at the global level requires *simultaneously*: (a) that actors are able to use the systems (or systems are universally usable), (b) that actors are able/willing/competent to act (or to communicate), and (c) that systems are able to support and enable actions [49]. It is obvious that the satisfaction of these requirements goes beyond the scientific-technological solutions and necessitates educational and governmental ones.

It is also obvious that achieving a dynamic fit between human and system components at the global level faces a variety of challenges [3]. For example, in *design time*, it is a challenge to anticipate the future usage conditions (e.g., who communicates with whom) in order to meet the contextual requirements of the use time: In *use time*, it is a challenge to appropriately judge/evaluate the effectiveness of such a dynamic relationship. In fact, the processes of both the design and evaluation of systems embody multiple claims that may change over time. For example, those involved in the design process may claim that a specific design option or system feature would enable specific actions at the global context, whereas people in use time may also raise similar or different claims and validate/evaluate them. Moreover, the claims in design or evaluation discourses involve many other controversial issues, ranging from the technological to cognitive to ethical and moral ones.

This said, we leave out technological issues and pay particular attention to ethical and moral ones. For this purpose, we take the perspective of discourse ethics [20] since it claims to be universalistic.

2.2. Pragmatic, ethical and moral issues

Habermas [20] differentiates between pragmatic, ethical and moral issues and related discourses. Pragmatic issues deal with rational choices of the means to achieve a given purpose. It can also involve the rational choice of goals in relation to a given value. In the context of design, such discourses may involve, for example, assessment of the requirements for being universally actable or assessment of properties with respect to their ability to achieve the given goals. This kind of exercise by the participants occurs within the horizon of purposive rationality; its scope is limited to pragmatic issues dealing with the evaluation/selection of means for achieving the goal agreed open or with the choice and legitimation of goals in relation to a value.

However, given the diversity of designers’ and users’ values [15, 27, 29], it is reasonable to assume

that values underlying the selection of goals can also be challenged. According to Habermas [20], when the values themselves become problematic, the question goes beyond the horizon of purposive rationality to include ethical issues dealing with whether it is “good” to act in this way in the long run.

Moreover, the justification of regulation from the ethical perspective may be limited to the perspective of a cultural group. As actions affect the interests of a global society, there is also a need to consider the regulations from the moral point of view, which requires generalization across conflicting societal or cultural interests, i.e. considering what is equally good or just “for all.”

As ethical reasons win out over pragmatic reasons, and moral reasons win out over ethical reasons, there is a continual increase in the complexity of the deliberations and the level of reflection. Next, we discuss how these different characterizations of issues are related to the design principles.

2.3. Adaptation principles as pragmatic issues

Current literature offers a set of design principles or guidelines that recommend what should be done to deal with diversity of users and contexts [5, 36, 42]. For example, for designing communication support systems, Te’eni [42] suggests a principle that states: “Design should support adaptive behavior, including the contingent use of alternative communication strategies, alternative message forms, and alternative media.”

Following such recommendations, developers of *adaptive systems* implement methods and techniques to enable the system to react to the user’s needs, goals, interests, and to the context of use dynamically [5]. Here we deal mainly with pragmatic issues, i.e., with rational choices of the means for a given end. Both the designers in design time and the system in use time make purposeful choices among available means to achieve the stated goal (e.g., to provide the user with the efficient navigation path to achieve his/her learning goal).

There are several examples of adaptive systems implemented in different ways to meet different goals [37, 5]. Common to all systems are that they implement a set of adaptation strategies to achieve their goals in interaction, for example, to communicate comprehensible and relevant information or to provide users with the interaction options/techniques that the user can handle skillfully.

Although many recommendations for adaptation (often implicitly) acknowledge that human interaction takes place within a context of values, norms, and

resources, they remain within the horizon of purposive rationality. They presuppose values and norms as given, as an influencing factor in achieving a goal, but do not extend to value and norm orientations themselves, that is they do not deal with the challenges of adaptation in group communications where diversity of values or norms exists. This calls for principles that particularly deal with the complexities and contradictions in a way compatible with ethical-moral considerations.

2.4. The ethicality and morality of design principles

To illustrate the ethicality and morality of design principles, let us consider communication maxims as examples of design principles. In our view, they best illustrate the diversity-unity paradox, the adaptation challenges and also the need for meta-communication.

Communication research not only provides us with empirical facts confirming communication diversity, but also with maxims of communication to cope with the challenges. Grice’s pragmatic maxims of communication [18] are well-known, claim to be universalistic, and are also considered in the context of HCI [e.g., 10]. The four maxims recommend: quantity (“Make your contribution as informative as is required”), quality (“Make a contribution you believe is true”), relation (“Be relevant”), and manner (“Be perspicuous”).

However, the universality of these maxims has been empirically challenged by Clyne [7]. Concerning the quantity maxim, he argues that it has limited relevance in cultures where content and knowledge are core values. In content-oriented cultures, the more knowledge provided the better. With respect to the quality maxim, he states that outside the legal and academic domain, in any competition with harmony, charity or respect, ‘truth’ not only need not, but should not, be a criterion. Clyne also claims that the ‘sincerity’ condition of an utterance does not apply to those cultures where the cultural core value harmony precludes this. He suggests a revised maxim which states: “Do not say what you believe to be in opposition to your cultural norms of truth, harmony, charity, and/or respect.” Regarding the maxim of relation, he remarks that this can be interpreted according to different kinds and focuses of relevance. With respect to the maxim of manner, he suggests some revisions including statements such as “Structure your discourse according to the requirements of your culture.” In contrast to Grice’s maxims, Clyne’s suggestions entail a greater degree of ‘relativism’. He argues that it is not even possible to propose universal maxims concerning negotiation of meaning, for some

cultures exhibit a higher degree of tolerance for ambiguity than others, e.g., Hofstede's [23] notion of uncertainty avoidance.

From the perspective of designers who seek orientation for enabling global communication, the maxims involve many difficulties and limitations. Taking Grice's maxims [18] as a guide implies ignoring empirical results questioning their universality. On the other hand, even though Clyne is explicitly concerned with diversity, following his advice cannot avoid the problems in many-to-many communication under the condition of value pluralism. Some of Clyne's suggestions are sender-centered and recommend senders to act according to the requirements of their own culture. Thus, they are subject to the criticism that they do not consider the receiver. Some of Clyne's suggestions are receiver-oriented and recommend adaptation to the culture of the other where possible. Intercultural competence is understood as the ability to communicate in accord with the expectations of a target culture. However, the problem with the adaptation strategy valued in many literatures is that it implicitly requires actors to possess the properties of a 'multicultural man' to be universally actable. The adaptation strategy is thus applicable only to some situations. Clyne's suggestions that actors should act according to the requirements of their own culture may be interpreted as a consequence of the adaptation challenges. Yet, it raises the issue whether designers only have the choice between the conventions of senders or receivers. Is the controversial issue just whether the speaker's or the hearer's culture should be the determiner of communication conventions?

According to Habermas [20], maxims are the plane on which ethics and morality intersect because they can be judged alternatively from ethical and moral points of view. A maxim that may be *good* for a group, may be *unjust* if its general observance is not equally good for all. He states: "Only a maxim that can be generalized from the perspective of all affected counts as a norm that can command general assent and to that extent is worthy of recognition, or in other words, is morally binding." [20, p. 8]. This view requires intercultural dialog to establish shared conventions under conditions of pluralism where competing conventions exist [48, 50]. Actors may regard such a prior mutual agreement as 'good for all'.

2.5. Implications

From our discussions so far we draw the following implications:

- First, the characterization of the dynamic relationship between human and system

components implies that any justification of the claim that a designed IT artifact is universally usable/actable remains open to challenge. This requires mechanisms to evaluate/review an IT artifact in a continuous and open-ended process, i.e. in design and use time.

- Second, Habermas' [20] distinction between pragmatic, ethical, and moral questions implies that the different imperatives (the purposive, the good, and the just) need to be justified in a discursive manner. This requires a discourse mechanism to reflect not only on the means and goals but also on values and norms.
- Finally, addressing ethical and moral issues implies active involvement of those affected by the system as - according to Habermas [20] - definition of "the good" and "the just" requires ethical and moral deliberations by those affected. This expresses the insufficiency of the evaluation from an observer perspective (e.g., evaluation by experts who are external to the whole system) and points to the need for including the users of the system. This also means that matters of value and norms rationality cannot be discovered solely in the design process because of the limits of user participation.

Thus we claim that some principles need to be implemented as features of the system to not only deal with the complexity but also to promote value and norm rationality, i.e., to allow ethical and moral deliberations in use time to cope with value conflicts.

3. Reflective principles for interactive systems

In this section, we describe why meta-adaptation and meta-communication can be viewed as two complementary principles, i.e., high-level design goals that hold true regardless of task or context in order to deal with the adaptation and ethical challenges. Whereas the meta-adaptation principle aims at helping to cope with the complexities and the challenges of adaptive communication, the meta-communication principle can help to compensate for the limitations of meta-adaptation as well as to deal with ethical and moral challenges. We justify the principles by referring to challenges that they may address, mention emerging artifacts to illustrate their realization options, and also reflect on some challenges for their implementation. Seen from a socio-technical design perspective, both mechanisms aim to balance the requirements of two competing systems, i.e. the technical and the social.

3.1. Meta-Adaptation Principle

3.1.1. Rationale. This principle suggests that a design should support meta-adaptation. As the discussion on the maxims in section 2.4 has shown, a meta-level adaptation ability is needed to decide where, when and how to adapt to increase the effectiveness and acceptability of communication. Generally, the need for meta-adaptation is based on the assumption that not only the diversity of goals, values, and norms, but also the diversity of adaptive technologies and strategies are developed to deal with complexity add further complexity. In other words, the meta-adaptation principle emerges from the evolution of adaptive technologies.

Meta-adaptation ability of a system may be useful in many situations that involve adaptation challenges. To mention a few: First, it can be needed in situations in which adaptation is either difficult or not desirable/acceptable [5, 37]. For example, adaptation can be difficult due to the lack of the technology, the lack of knowledge of what and how to adapt or the presence of competing options. Adaptation may not be desirable/acceptable, for example, when the user's learning is preferred or when the adaptation violates other standard usability principles (e.g., consistency). In addition, adaptive applications imply the risk of the user feeling a loss of control of the application, or not trusting the application [40]. As mentioned in the introduction, there is also a tension between adaptation and the privacy and security of information stored for the user [26]. Moreover, adaptation may not be acceptable due to the performance limitation of a technology to satisfy the computational requirements (e.g., a slow machine or network with limited bandwidth). Finally, there is an argument that adaptation is not a goal in itself, but rather a way of improving the usability/effectiveness of a system, and that there may be other ways of achieving the same goal [37]. These insights point to the need for a meta-level ability to monitor and decide whether an adaptation is possible, appropriate or acceptable in the given situation.

Second, meta-adaptation is particularly necessary in situations where the adaptation is possible or desirable, but requires the decision on which adaptation strategy/technology is most appropriate. Empirical works show that different techniques work most efficiently in different contexts. For example, restrictive technologies limiting the navigation choices are more relevant for users with little or no knowledge of the subject, whereas users with good knowledge of the subject may appreciate "rich" linking technologies [6]. In addition, Kobsa [26] argues that multi-pronged

strategies are needed to reconcile the tension between personalization and privacy.

Hence, we can conclude that meta-adaptation technologies emerge as a natural process of evolution of adaptive technologies. According to Brusilovsky [6]:

“A meta-adaptive system should have a number of different adaptation technologies at its disposal. It should also be aware about the limits of applicability of every technology and be able to adaptively select the very adaptation technology that fits best the given user and the given context. It is also natural to expect that meta-adaptive systems will be able to constantly extend their own knowledge about the applicability of different technologies by observing the success of these technologies in different context and learning from these observations.” [6, p. 11].

Yet, this raises the issue: Does meta-adaptation need to be self-regulated? Or can the meta-level activities be supported through an entirely human-facilitated approach? We may call these different orientations *meta-adaptivity* versus *meta-adaptability*. Whereas the former is achieved through self-regulated adaptivity, the latter refers to a user initiated meta-level adaptation. A meta-adaptable system allows more user control than a meta-adaptive system.

3.1.2. Applications. Are there emerging applications of this principle? A *Google* search indicates that this term is used in some works. However, besides theoretical frameworks [e.g., 8, 35], we are not aware of any system that is designed explicitly for this purpose.

Yet, several technologies involve meta-level rules or knowledge for judging lower level rules to activate them, and are thus closely related to the essence of the meta-adaptation principle. For example, reflection and open abstraction have been considered earlier as the principle of computational reflection. Computational reflection is regarded as ‘the principle that a computational system can embody, within itself, a model of its own behavior (a self-representation) which is causally connected to that behavior.’[11]. Such systems can examine their own behavior through examination of the model, can “reason” about their own activities and also change their future behavior by making changes to the model. The reflective principle was originally demonstrated in the area of programming language by giving the language explicit access to its own interpreter. For example, a program could look at the function call sequence recorded in the interpreter's data structures, make changes to the structures, and alter its behavior. The principle has also been combined with the techniques of object-oriented programming to yield the so-called meta-object protocol, which embodies a reflective self-

representation in the structures of object-oriented programming. Several working examples demonstrate the applicability of the reflective techniques in a wide range of software application areas [11].

What distinguishes user-centric meta-adaptation is its focus on the selection of adaptation strategies and technologies informed by the characteristics of the users and interaction contexts. A fundamental requirement for the meta-adaptivity is the ability of the system to perform self-evaluation. That is, the system should be “aware” of the existence of alternative adaptive behaviors and should have some way of assessing the extent to which these alternatives, when used, satisfy the adaptation goals. According to Paramythis [35], meta-adaptivity requires:

1. Explicit representation of alternatives.
2. Explicit representation of adaptation goals/objectives.
3. Supporting categorization and ranking of alternatives.
4. Self-evaluation and creation of adaptation knowledge.
5. Maintainance of “history” of model changes.

Even though there is no implementation of a system with these characteristics, we should note that the applicability of such a meta-adaptive approach requires that a self-regulating infrastructure is already operational, and that the cost of authoring alternative adaptation strategies and providing the system with meta-data for using and managing them is not prohibitive. In addition, it requires that designers review and validate the findings derived by the system through self-evaluation [35].

However, seen from a human-centered perspective, meta-adaptivity poses an even greater “threat” to the ethical-moral values as well as to traditional usability qualities of interactive systems (e.g., predictability) than traditional forms of adaptivity. In contrast, a meta-adaptable system can avoid such problems by allowing users to control the meta-level adaptation activities. Examples for such user-controlled meta-adaptation can be found in learning systems that offer several learn strategies and adaptation strategies and that allow the user to control adaptation [9]. Meta-adaptability is viewed as learner control opportunities. Learners are provided with opportunities to undertake an active role in the learning process and are informed about the internal workings of the system. For example, INSPIRE [19] learners select the learning goal to study and the content is presented in a hypermedia form, enabling learners to follow their own navigational paths (what to learn). Learners can also select the type of content to study (how to learn). Learners have the option to intervene in the adaptation process by

modifying their model and to deactivate the system’s adaptive functionality (control over adaptation). Moreover, learners may follow system’s suggestions, or intervene and guide the instructional process through modifying their characteristics in the learner model, or deactivate adaptation and take full control over the system (control the amount of control).

Nevertheless, some unresolved issues and challenges still remain, particularly with respect to the adaptation to groups [24]. Next we discuss why and how the meta-communication principle can help.

3.2. Meta-Communication Principle

3.2.1. Rationale. This principle suggests that a system should support meta-communication, i.e., communication about a system’s communications and actions. It responds to several challenges around the socio-technical gap between what is socially desired and what is technically possible [1].

To mention a few: First, it is a response to the limits of adaptive and meta-adaptive approaches that emerge as alternative to the traditional “one-size-fits-all” approach. The argument is that in situations where adaptation is not possible/desirable, a legitimated “one-size-fits-all” approach might be the alternative. Consider, for example, group communications with diverse members which do not permit the adaptation of a communication pattern. Rather: it requires a group’s prior agreement on a common pattern [48], in the sense of what is ‘good’ or ‘just’ for them. Meta-communication facility can promote mutual understanding on common communication and action patterns. This implies negotiating reality and mutual learning [2] and, as a consequence, overcoming constraints in the communication repertoires.

Second, this principle is also a response to the general design challenges. For example, open-ended and multidisciplinary design problems involving a combination of social and technological issues do not have “right” answers, and the knowledge to understand and resolve them changes rapidly [3]. Different stakeholders involved in the design decisions may have different goals and priorities that in turn may lead to different value trade-offs [15]. The interpretations of those involved in design and evaluation may change over time, and the trade-offs of values within and among organizations may shift. Hence, the argument is: if we cannot fully account for the requirements of dynamic environments and multiple communication conventions, a promising alternative is to provide actors with meta-communication facilities to articulate the mismatches at the use time. Feedback is regarded as a powerful mechanism for the articulation of conventions and learning about group behavior [30].

Finally, the principle is a response to the evaluation challenges. System design involves value and norm decisions [25]. From the perspective of discourse ethics [20], the decision on what is good and just must be left to those affected. The challenge is that it is unrealistic to involve all users in the discourse during design and implementation, and that the interpretations of those involved may also change over time. If there is no way to get around this problem, the remaining option is to provide a meta-communication facility for feedback in use time. Post-implementation participation is viewed as more effective in garnering user interest and assistance [43].

The meta-communication principle can be applied in the system development process, for example to negotiate the structure or norms of communication within a participatory design process. This paper argues that this is insufficient and that meta-communication mechanisms need to be implemented as features of the interactive system to allow reflections in use time.

3.2.2. Applications. Are there such emerging applications of this principle? In fact, many technologies promote meta-level communications or feedback. For example, software interface elements (or “widgets”) such as icons, buttons, agents, etc. are constructed as built-in software features that provide awareness of communication activities or allowing readers of a document to email the author, provide evaluative feedback, etc.

A good example of a system with meta-communication facility is Wikipedia, which allows continuous discussion on the forms and contents of its articles. As each article communicates its content, the communication about each article can be viewed as a meta-communication. In other words, Wikipedia evolves through its meta-communications.

There are also a set of tools that allow user participation in use time to communicate system failures, design or usability problems that appear in use contexts [33, 41]. These tools include the unknown users in the open-ended design process by providing different communication channels to allow them to express their experiences and make design suggestions. Even though they do not use the term meta-communication, they enable users to communicate about the way of how the system communicates with them.

Finally, there are also models that explicitly refer to meta-communication. For example, the meta-communication model suggested by Yetim [48] is mainly based on Habermas’ discourse theory [21] and has been implemented as a discourse tool [47]. The tool provides structures to systematically reflect on a set of basic issues and potential breakdowns in global

communication. When integrated in the interface of an application system, it allows the users to critically reflect on the information communicated by an interactive system. In particular, it allows them to evaluate the *comprehensibility* of signs at the physical, syntactic, and semantic level, the *relevance* of signs for the current purpose, the *validity* of the contributions (including their expressive, empirical, and normative validity), and finally, the *rationality* of the contribution for effective communication. The model also includes discourses on value and norm issues.

Nevertheless, it is important to note that a change of the system through meta-communication requires infrastructure that links meta-level functions of applications and different communication channels in order to support the user-driven adaptation. To our best knowledge, the meta-communication and meta-adaptation facilities have not been jointly considered in interactive systems.

4. Discussion and Conclusion

This paper focused on the design challenges at the level of design principles. It assumed that design principles provide recommendations/prescriptions in terms of “what should we do” and that they may be more or less rational for global contexts. By taking a global perspective informed by Habermas’ discourse ethics, this paper claimed that the design of interactive systems requires going beyond the concept of purposive rationality to include value and norm rationality. It is further claimed that the value and norm issues cannot be resolved in design processes but rather require changes in the nature of the artifact and the inclusion of reflective mechanisms.

This paper argued that meta-adaptation and meta-communication as two complementary design principles are needed to answer two challenging issues, namely, what should be done to reduce the complexity in order to allow efficient and effective interaction and also to address ethical moral challenges appropriately. We believe that particularly user-centered approaches to meta-adaptation (i.e., meta-adaptability) can support the reduction of complexity to some extent when designed purposefully. With respect to meta-communication principle, the claim is: if technology is that complex, whether flexibilization technologies can be bent to a level at which user communities can develop their norms and values around the system and reliably act with them. Through this process of participation, a system may take on various forms across various environments [15, 17]. Consequently this may “create new ways of being that did not exist and a framework for actions that would not have previously made sense” [44, p. 176].

Current user-centered approaches to information systems share some characteristics with these principles, yet, they are only partly realized in working system prototypes. Approaches to adaptive systems [e.g., 5] are mainly concerned with techniques of adaptation (personalization) and pay less attention to the issue of user participation in use time. Others deal with the merits and challenges of the user participation (see [22, 31] for an overview), but do not offer mechanism for user participation in use time. Still others who are mainly concerned with feedback mechanism in the form of usability reports [e.g., 33, 41] are not concerned with issues related to value conflicts. Therefore, this paper argues that the two reflective principles together integrate these aspects in a single design framework and may help to overcome some of the deficiencies.

The ideas presented so far have implications for both the design process and the designed artifact. Concerning the design process, the consideration of the discourse ethical view implies that systems designers functioning as moral agents will never truly be able to determine if moral actions are justified or not. Therefore, it is necessary to expand the design community as a public space, in socially inclusive ways that democratize the design process. From this perspective, the design decision rests largely with those individuals who live with the consequences of the design decisions. Discourse ethics guides the process to consider pragmatic, ethical, and moral issues in making design decisions. In this sense, it informs the design community how to design systems in a pluralistic world where many diverse perspectives of what is 'good' exist and where solutions must be found to ethical challenges through the elaboration of valid and acceptable norms.

In fact, many user-centred approaches that promote user participations implicitly or explicitly acknowledge the impact of design communication on the resultant system and value the legitimacy of the resultant system thorough communication. Yet, the global challenges due to the differences in communication maxims, conventions, forms, and norms imply that facilitating communication in design process is alone insufficient. Rather: there is a need for meta-communication, i.e., communication about design communication in order to achieve mutual understanding about the forms and norms of design communication. For example, systems development communication can be viewed as an interrelated set of genres (or recurrent patterns) of communication [34]. Taking a discourse ethical perspective, Yetim [48] showed how meta-communication about communicative genres can be guided by discourse-ethical principles to legitimate their norms. Hence, taking a universal perspective

guided by the ideas of discourse ethics implies that the genres of design communication need to pass a discursive test in a meta-communication. According to our best knowledge, this aspect has not yet been explicitly considered in current user-centered design approaches.

This suggests that practitioners should first legitimate the communication process of the design, i.e., establish a common set of communication practices and then continue with the application of user-centred design techniques. In addition, in order to deal with the limitation of participation in design discourses appropriately, practitioners should implement the meta-communication mechanism in the system to allow the future users to articulate their views and needs in use time and to initiate adaptation or changes in the system.

Concerning the implications of this research for the information systems as designed artifacts, one relevant issue to be discussed is whether the ideas are applicable to all types of systems. There are different types of systems with different degrees of interactivity. Some act towards the users (e.g., provide information), others also allow the users to act towards the system (e.g., to enter information in the system). Some systems only indirectly mediate information between people, others support their communications directly. Nevertheless, all these systems have in common that they have user interfaces to present the results of their actions and/or enable users to act with or through the system (e.g., insert, save, send). A system embodies a repertoire of actions with related vocabulary, which both enables and delimits users' and systems' actions. A system's actions can be evaluated, for example, with respect to whether they are comprehensible, valid, appropriate or effective. Similarly, a system's interface can be evaluated according to whether its action repertoire offers actions which provide comprehensible, easy to use, appropriate or efficient and effective ways of acting in the given situation. In this sense, the principles can be applied to all systems that offer a set of action potential, dealing with diverse users and/or diverse use contexts.

Yet, the relevance of the principles may vary depending on the types of systems. The implementation of the meta-adaptation as system features requires the existence of a set of diverse technological means or strategies of action, whose appropriateness is context-dependent. Thus, for systems designed for serving a particular user (e.g., providing decision support for a doctor) or tracking user's actions (e.g., when employees enter or leave a company) a meta-adaptation mechanism may be less relevant. On the other hand, as all actions of a system can be critically evaluated, a meta-communication

mechanism can be realized in any system for providing feedback to the system's (communication) actions. Both reflective mechanisms can apply to systems that mediate communication among diverse individuals. For example, by considering the interests, preferences and background knowledge of the communicating actors, a meta-adaptation mechanism can select the most appropriate adaptation strategies to provide automatic communication support (e.g., providing translations or warnings before sending a message), whereas a meta-communication facility may enable them to establish shared communication praxis during the use of the system.

As mentioned before, there are models and systems that share characteristics with these principles, yet, they are only partly realized in working system prototypes. Future research should focus on refining the principles and developing hands-on guidelines to support designers and evaluators in practical situations.

5. References

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