Value Pie: A Culturally Informed Conceptual Scheme for Understanding Values in Design

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Abstract. Interactive technologies have spread from the context of the workplace to our homes and everyday lives, and people use them for different purposes, through different devices, and in quite different and complex contexts. In the last years, the HCI research community has devoting attention to the subject of values, pointing out to the need for placing values in the core of technology design, and for studies that support researchers, designers and practitioners in doing so. In this paper, we introduce the Value Pie: a theoretically grounded artifact created to support the understanding and involvement of values in design. The paper presents the grounds used to create the artifact and discusses on how it can favor a comprehensive and informed understanding of values and their cultural context.

Keywords: Organizational Semiotics, HCI, Culture.

1 Introduction

In the mid 50s, Sharp [1] analyzed how the introduction of the steel axe by a group of missionaries undermined the stone axe and triggered destructive changes in the Yir Yoront Aboriginal tribe. It was expected the steel axe to improve natives' productivity and quality of life, but what was perceived was an inevitable collapse of the tribe traditional culture and values.

The Yir Yoront example draws attention to the impact that technology causes on the environment it is inserted and on the people that live in it (even in those who do not use the technology). This impact may be caused by the technology itself, the way it is introduced, the way it is used, the interests behind it, and so on. Therefore, thinking of the values and the culture of the different stakeholders involved in a design context is an ethical commitment we must assume as researchers and practitioners in the technological field.

Interactive technologies are a growing reality worldwide and people use them for different purposes, through different devices, and in quite different and complex contexts. As Bødker [2] asserts, technology has spread from the context of the workplace to our homes, everyday lives, and culture.

Sellen et al. [3] recognize values as a critical issue when designing technologies for the digital age. In this context, as Winograd [4] had already argued, the designer's role goes beyond the construction of an interface to encompass all the interspace in which people live, requiring a shift from seeing the machinery to see the lives of the

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people using it. This shift demands attention to relevant factors that become hard to quantify and even identify: values and culture are surely among them.

A value cannot be understood outside its cultural context. While a value indicates something that is important and needs to be taken into account, the cultural context explains why such value is important. In the Yir Yoront example, the missionaries offered some western goods for the natives as a gift/payment for their services: the steel axe was the most disseminated and accepted one. The missionaries, however, ignored the fact that the stone axe was a central tool in the tribe culture: it was used for producing food, constructing shelter, heating their homes; it represented power and defined the hierarchical position in the tribe; different rituals and celebrations were conducted involving the stone axe; only the old men had the right to possess a stone axe, etc. When the missionaries distributed steal axes equally for men, women and even children, they broke this entire structure. Elders, once high respected, become a burden to the tribe; rituals lost their meaning and importance for the younger; trading activities involving the stone axe produced by the tribe disappeared, and so on. The destructive consequences of the steal axe were triggered more by the way it was introduced in the tribe than by the technology itself. Because the missionaries ignored the tribe culture and values, they had no strategy, no plan, no knowledge about the environment, and no means to know the possible consequences of their actions.

In fact, the implications of values (or their lack of consideration) in the design of technologies are usually too subtle and only noticed when a social rule is violated, a behavioral pattern is broken, or a conflict of interest arises. Friedman [5] argues that, because designers necessarily communicate values through the technology they produce, values emerge from the tools designers build, and how people choose to use them. As the author highlights, although the neglect of moral values in any organization is disturbing, it is particularly damaging in the design of computer technology because, unlike people with whom we can disagree and negotiate values and their meanings, we can hardly do so with technology.

In this sense, although there are some initiatives that contemplate values in technology design, some authors [6] claim that the existing models and approaches usually restrict the analysis to a set of preconceived values, rather than encouraging designers to inquire about other values that may appear and that are relevant to a particular context. As [6] suggests, models which consider global values and do not account for their cultural nature, if followed strictly, may prevent the identification and understanding of some important and culturally specific values.

The Value Pie (VP) is a culturally informed conceptual scheme we proposed in [7] for organizing values identified in the context of social software. The VP was built on the grounds of Organization Semiotics [8] and the Building Blocks of Culture [9], organizing values according to their formality and areas of culture — see Fig. 1. To our knowledge, the VP is pioneer in supporting the consideration of both culture and values in an explicit, informed, and integrated way.

In addition to support the organization of values, we have used the VP for supporting and grounding discussions on specific values (e.g., emotion and affection, privacy, identity). For instance, in [10] the VP was used to ground discussions about

reputation on web communities from the perspective of values, allowing us to approach reputation according to three dimensions: formality (informal, formal, technical), culture (the "Classification" slice of VP) and interplay — the relationship of reputation with other values and VP's slices. In that work, the VP allowed us to understand reputation as a cultural value for a given community of users, informing the design of computing features for reputation in a social software designed with representatives from the community. It also encouraged the analysis and inquiring about other values that emerged from and were relevant to the design context, such as Identity, Privacy, Security and Collaboration. Understanding reputation as a value for that community and discussing it from different perspectives grounded the design of features for supporting this value in a social network system.

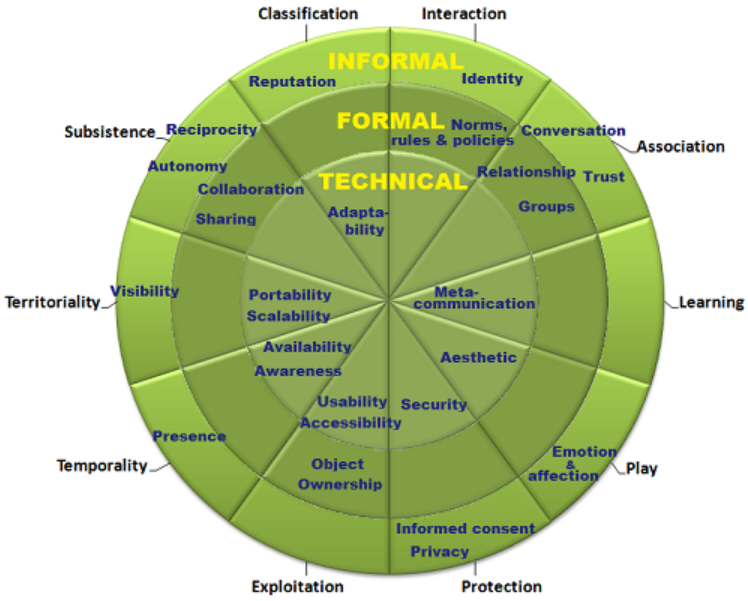

Fig. 1. The VP and Social Software Values

The VP has shown to be able to inform and support the work with values in design activities. It articulates different theoretical and methodological theories, favoring a comprehensive, informed and situated understanding of values and their cultural context. In this paper, we present the VP as a comprehensive and useful artifact for guiding discussions on values in design. We claim for a culturally informed view for understanding values in HCI, approaching key issues (e.g., usability, accessibility, privacy) from the perspective of values. Therefore, this paper: i) presents the theoretical bases articulated to create the VP; ii) introduces the VP as a conceptual basis for supporting the understanding and discussion of values in the design of interactive systems, and iii) presents examples and discussions of its application.

2 Value Pie's Foundation

The natural act of thinking is strongly modified by culture [11]. Authors such as Hall [9] and Schwartz [12] assert that values, their importance and roles,vary strongly according to the culture being analyzed. According to Hall [9], culture refers to people's attitudes, material things, learned behavioral patterns, and values; it represents the very different ways of organizing life, thinking, and understanding basic assumptions about the family, the economic system, and even the mankind.

When talking about culture, Hall [11] believes it is more important to look at the way things are put together than at specific theories. In fact, although it is useful to enquiry about specific situations, understanding the cultural context in which people live can offer more information than looking at pre-defined hypothesis. In this sense, aiming to formalize and structure the characterization, analysis and comparison between different cultures, Hall [9] proposed 10 Primary Messages Systems (PMS), or areas, named the basic building blocks of culture: Interaction, Association, Learning, Play, Protection, Exploitation, Temporality, Territoriality, Classification and Subsistence, suggesting that cultures develop values with regard to them. These areas are the ten slices in VP (Fig. 1) and can be understood as follows:

Interaction: to be alive means to interact with the environment, and everything people do involves interaction with something/someone else: people, systems, objects, animals, etc. All the other following areas have interaction in their nature: as Hall [9] asserts, interaction is at the centre of the universe of culture and everything grows from it. Values in interaction are related to the preferred forms of communication between people, behavioral patterns and social protocols, the importance of other living things and the concern with them, etc. The identity of a people is the sum of their characteristics, including all its values.

Association: all living things organize their life in some pattern of association. Governmental and social structures may vary strongly according to the culture, not only in nature, form and function, but also in importance. Values in association are usually related to the way society structure itself, its groups, public and private organizations/entities, the role and importance of family and other social relationships (e.g., friendship, partnership, marriage), and so on.

Learning: learning has an important role in the course of man evolution, being one of the basic activities present since the beginning of life. Education and educational systems are strongly tied to emotion and as characteristic of a culture as its language. Values in this area are related to the preferred styles of learning (e.g., informal, formal), the importance given to different forms of knowledge, the valued abilities, knowledge and professions, as well as the relative importance of experience, expertise, meritocracy, and so on.

Play: funny, emotion and pleasure are terms related to it. Although the role of this area in the evolution of species is not well understood yet, it is clearly linked to the other areas — e.g., in learning it is considered a catalyst; in relationships a desirable characteristic, the notions of beauty and attractiveness are influenced by culture, etc. Values in this area are clearly linked to emotional and affective aspects. As Hall [9] asserts, if one controls the humor of a people, s/he is able to control almost everything else.

Protection: originally named "defense", we adopted the modification proposed in the OS theory [8]. Cultures have different mechanisms and strategies of protection (e.g., medicine, military strategy, religion). Defense is a specialized activity of vital importance, and people must defend themselves against not only hostile forces in nature, but also internal forces and those within human society. Values in protection are related to the rules, strategies and mechanisms developed in order to protect the space (physical, digital, personal), the objects used to guarantee protection, the medical therapy adopted/preferred, etc.

Exploitation: this area refers to the use of materials in order to explore the world. Materials in an environment are strongly related to the other aspects of a culture: there are specific tools and artifacts for cooking, protecting, playing, learning, etc. It is impossible to think about a culture with no language and no materials. Values in exploitation are related to the preferred tools, objects, instruments, and procedures for working, playing, learning, protecting, eating, etc., and their importance.

Temporality: time is related to life in several ways: from cycles, periods and rhythms (e.g., breath rate, heartbeat) to measures (e.g., hours, days) and other aspects in society (e.g., mealtime, vacations). There is specific time for different activities, expected time for marrying, reasonable time to forget an offense, pre-defined time to pay for a debt/crime, and so on. Values in this area are related to the ways people deal with time, its importance and roles in society.

Territoriality: while having a territory is essential to life, the lack of a territory is one of the most precarious conditions. This area refers to the possession, use and defense of space: there are physical (e.g., country, house, bedroom) as well as social (e.g., social position, hierarchy, position in a line) and personal spaces (e.g., personal data and stuffs, office desk). Values in this area are related to the ways space is understood, used, distributed and valued in the society.

Classification: originally named "bisexuality", this area is related to the differences in terms of form and function related to gender. Cultures have different forms of distinction and classification, and give different importance to each one. We preferred to use the name "classification", suggested by the OS theory [8], in order to encompass, beyond differences in gender, the ones related to socio-economic conditions, age, abilities, etc. Values in classification refer to preferred style of dressing, jobs, sports, and so on, of men and women; the importance given to different social statuses and classes; the rights/obligations of people according to pre-defined classifications, etc.

Subsistence: this area includes from people's food habits and jobs to the economy of a country. Professions, supply chains, deals, natural resources are all aspects related to this area, being influenced not only by the other areas but also by geographical and climatic conditions. Values in subsistence are related to the importance and conditions of working and retirement; foods, nourishment and sanitation preferences/habits; the way the society understands and deals with inequalities, social policies, public interests, etc.

Hall [9] also introduced the notions of informal, formal and technical levels in which humans operate and understand the world: the VP's three layers (see Fig. 1). These levels are simultaneously present in everything, although one always

dominates, and we deal with them separately. For instance, during elections, people talk about their preferences and candidates, proving/recommending a certain candidate, criticizing, and so on: this is the informal in action. People may also join a political party, and participate in interviews and prospection pools; there are specific dates and requirements for voting, and so on: the formal is dominating here. Finally, there are solutions developed in order to receive and compute votes, such as electronic voting or paper ballot: here, the technical aspect is emphasized. When a level is dominating, the other two are underlying it. For Hall, understanding the shifts between these levels is the basic requirement to understand the process of change.

Stamper [13] proposed a structure represented by the Semiotic Onion that explains how these levels exist in the context of organizations and information systems (see Fig. 2). The informal represents the organizational culture, customs and values that are reflected as beliefs, habits and individual behavior patterns of its members. The formal corresponds to aspects that are well established and accepted, becoming social conventions, norms or laws; in this level, rules and procedures are created to replace meanings and intentions. Finally, the technical situated in the core of the onion represents aspects that are so formalized that can be technically approached and supported. Therefore, the semiotic onion illustrates that any technological artifact is embedded in a formal system that, in turn, is embedded in an informal one.

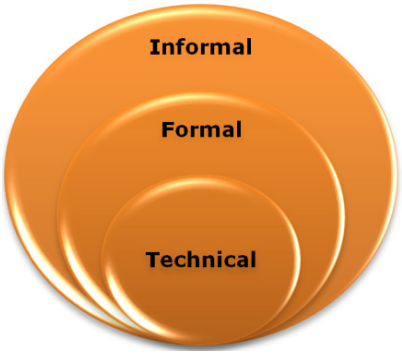

Fig. 2. The Semiotic Onion

Baranauskas [14] argues that the three levels must be considered for a socially aware design of computing systems. In fact, we must consider the three levels in which values may be manifested in society and understood by its members. Otherwise, important values may go unnoticed, being identified only when some problem arises (e.g., the need for adaptability), and important aspects of values may be misunderstood, or neglected, making no sense to users (e.g., a reputation feature that causes embarrassment instead of motivation).

3 Value Pie's Dimensions

The VP was built on the grounds of Organization Semiotics theory [8] and the Building Blocks of Culture [9]. It is formed by three layers that organize values according to their formality, and is divided into ten slices that recognize the cultural nature of values — see Fig. 1. The three layers (informal, formal and technical) represent the different levels in which humans operate and understand the world proposed by Hall [9], and are structured according to the Semiotic Onion to reflect the way they are perceived in the context of information systems [13]. The ten slices represent cultural patterns of behavior in which values are developed, and that allow the mapping and comparison between different cultures [9][11].

The VP artifact supports the understanding and discussion about values from three different perspectives: Culture, Formality, and Interplay. These perspectives bring quite different aspects of values that must be considered in order to have a comprehensive and consistent view of them. Following, we explain each dimension.

3.1 Culture

Values are developed in different cultures according to basic behavioral patterns: from the tools people use to the things they consider important in life, from the way they associate and protect to the way they learn and play, from the way they understand time and space to the way they interact and subsist in the world. Humans tend to interpret the world according to their cultural lenses. Therefore, ignoring the cultural nature of values results in a narrowed comprehension about them and their role in stakeholders' culture; it may even mislead the design process, resulting in solutions that do not make sense to stakeholders, do not meet their demands and that, possibly, trigger undesired side effects on them. The VP slices represent the ten areas of culture because considering the areas related to each value contributes to a better understanding about the significance of the value for a given culture, as well as about the culture itself.

For instance, "Privacy" is defined by Encyclopedia Britannica [15] as "*the quality or state of being apart from company or observation; freedom from unauthorized intrusion (one's right to); a private matter*". Understanding privacy as a value in a situated contexts requires understanding the cultural roots of this value. Considering the definition of privacy and the explanations for each are of culture, we can understand privacy as a value developed in the Protection area, reflecting importance of protecting personal information, things, ideas etc. What is necessary and/or expected to protect and why, what are the means to protect it, the extension and limits of privacy, and the importance given to it are examples of aspects that differ strongly according to the culture being analyzed.

3.2 Formality

Values have different facets that are situational, varying not only according to the cultural context, but also across time and space. Discussions on values usually

represent a snapshot in which some aspects are visible and some are not. To see other relevant aspects, one must take another snapshot, from a different angle. Therefore, when discussing values, it is necessary to pay attention not only to the culture areas in which they are manifested, but also in the different levels of formality. Values are manifested in one of the three levels (informal, formal, technical layers in the VP), but have aspects to be considered in all the three simultaneously.

Values manifested in the informal level usually have a personal or ethical nature; values manifested in the formal level are collective or social values where there is a social rule or system of norms; and values placed in the technical level can be understood as quality attributes or special features related to technological artifacts. For instance, considering the examples of privacy, people from different cultures have their own informal understanding of what privacy is, its meaning and importance. There are social protocols, conventions, rules and laws that are formally established to define the limits and guarantees of an individual's privacy and that varies according to the culture being analyzed. There are also some facets of privacy that are so formally accepted that can be technically supported, such as a curtain to cover a window, the wall for restricting the visibility of a house, secrete voting for elections, and the privacy of medical examinations.

According to Stamper [13], norms stand for a field of force that governs how members think, behave, make judgments and perceive the world. Norms are present in the formal aspect of each value and are the bridge between the informal and the technical levels. They regulate and influence people's behavior, specify rules and policies, and determine the way technical features work. Therefore, if social norms are not understood in their cultural settings, they tend to be automated by technical features that do not make sense to users and do not afford the behaviors they are used to in their social world.

3.3 Interplay

The VP is not a classification scheme in which the elements are assigned to one and only one class within a system of mutually exclusive and non-overlapping classes. Values may be developed at the intersection of multiple areas, and they may interact with each other. In fact, although values have a clear relationship to an area, they usually illustrate some aspect in which the area interacts with other area, and reveals other values that influences/are influenced by it. Using the example of privacy again, it is a value developed in the protection area, but it has a clear intersection with "Territoriality": privacy is the protection of the space (personal, social, physical).

Schwartz [12] draws attention to the interactive nature of values according to their underlying motivational principles. The VP reinforces the interactive nature of values, but considering the relationships according to values' cultural nature: it assumes that values developed in the same area of culture, i.e., values placed in the same slice in VP, have a natural relationship to each other. Because all the ten areas interact with each other and values may be developed in the intersection of them, designers must also pay attention to the values developed in related areas. There are at least three kinds of relationships: dependence, congruence, and conflict.

Dependence means that a value is so strongly related to other values that it cannot be approached in a direct way; i.e., it depends on others values to be considered.

Congruence means that a value has compatibility with other values, extending to them the positive/negative effects it suffers; i.e., when promoting a specific value other related values are endorsed. This relation is bidirectional: the promotion of related values triggers positive effects on it. In the same way, the lack of attention to the value triggers negative impacts on the related ones.

Conflict means that a value competes with other values; i.e., promoting a specific value compromises the related ones. This is also a bidirectional relation: the promotion of related values may trigger negative effects on it.

4 Using the Lenses of Values: Practical Steps

From the core areas in Computer Science listed by ACM, HCI is the area that must both to deal with issues that are universal and transversal to other areas and to consider specific aspects (e.g., social, cultural, political, economic, geographic) of the environment in which its application occurs. These characteristics confer to HCI a key role in the design of solutions for a society mediated by information and communication technologies and a strong responsibility regarding the impact caused by these technologies.

The subject of values, therefore, is not only a matter of research, but also a matter of practice and posture in our academic and practical fields. It is a matter of seeing the world through the lenses of cultural values, revisiting well-known concepts, methods and theories, rethinking our tools and practices, redefining the focus of our teaching disciplines.

Bannon [16] provides interesting examples that show the need for understanding values in their socio-cultural context when designing technologies. Talking about "Ambient Assisted Living", he mentions how often designers and even researchers conduct their researches and develop their products hoping they will support elderly people living independently, having a better quality of life at home instead in an institution, and not becoming a burden on other people or on the state as they grow older. However, he highlights that, although much of this work is justified by the need of "empowering older people through independent living", on closer examination they are more engaged in providing fulltime remote monitoring of these people than in adding to their dignity or empowering themselves to remain autonomous.

The development of educational technologies, especially for disable students, usually falls into the same trap. Researchers and teachers are often interested in promoting students learning, developing their abilities, capacitating them to use technology, etc. However, although these studies present a sounding theoretical and methodological foundation, applying user-centered design, and defending social inclusion, on closer examination some of them end up: only automating activities and procedures conducted at the classrooms; expecting students to achieve a "normal performance"; and evaluating students according to pre-defined parameters. It means that, in both the examples, the concern with the central people (elderly, students),

their real needs, concerns and values is not primary as it would be expected, but secondary.

In Bannon's example [16], thinking on technology development or medical assistance before understanding the stakeholders and their values may prevent the understanding of more basic issues, such as elderly people's need to be in contact with their family, friends and neighbors in a natural way; the need to manage their privacy and keep control over themselves, etc. In our example, thinking on technology development and pedagogical goals before understanding the students and their values prevent the development of technologies that make sense to them, add to their quality of life and promote their welfare. It may even prevent the design of new teaching strategies that consider students and their particularities, developing the abilities necessary for the students' context of life, evaluating them according to their own progress.

The VP is able to support the reasoning and discussion of existing concepts through the lenses of values, regardless the design process, techniques and tools adopted. The simple act of mapping a concept into VP's different dimensions provides a values-oriented and culturally informed view of the concept and related issues. Some practical steps for using the VP are:

- Select a concept to be discussed: try to look for critical/important concepts involved in the design context. For instance: accessibility.
- Identify the slice (area of culture) it is related to: considering the explanations presented for each VP's slice, identify the one that the chosen concept is clearly related to (if more than an slice is suitable, see which one is the dominating and consider the other as a related area). According to the VP and the values suggested by [7], accessibility may be related to the "Exploitation" area, i.e., it is as a value related to the exploration of the world.
- Investigate the informal, formal and technical aspects related to the selected concept: remember that each value has aspects to be simultaneous discussed at these three levels. For instance:
  - *Informal*: the first thing to recognize is that people have different needs, views, understandings and expectations regarding accessibility. Different stakeholders will value and react to accessibility in a different way. Therefore, it is important to clarify the role and importance of accessibility for the situated context of design.
  - *Formal*: there are rules, laws and norms related to accessibility that must be understood and followed. There are accessibility standards and certifications, requirements for accessibility, formal training and education, etc. Even in cases where there is no formal regulation, there will be well-defined social protocols that explains how a society deals with a given value.
  - *Technical*: there are physical structures, tools and technical devices for providing accessibility (e.g., assistive technologies), or that require accessibility. There are public and private services related to accessibility, technical procedures, frameworks, and so on. Technical features communicate and disseminate values, causing impact on them.

- Analyze the possible relationships with other:
  - Areas (VP's slices): the value may have aspects manifested in other areas, being influenced by them. For instance, accessibility has a clear relationship with the interaction area and is commonly approached according to pre-defined criteria/types (classification) — e.g., kinds of impairments, aging, education. Physical accessibility is related to territoriality and may depend on the time (e.g., having something available); the (lack of) accessibility may affect values related to subsistence, etc. Each area may offer a different perspective to the value being considered, favoring a wider perception regarding its impact on the design context.
  - Values: as we pointed out, a value interacts with other values in different ways. For instance, promoting accessibility is a basic requirement for supporting autonomy, guaranteeing that people will find no barriers for living and acting regardless their limitations and specificities. The lack of accessibility impacts negatively on peoples' autonomy, as well as on other values such as privacy (e.g., a person has to depend on others to conduct basic activities), emotion (e.g., motivation, welfare, self-esteem) and identity (e.g., who the person think s/he is in the world, the things s/he can do, the aspirations s/he may have).

Approaching a concept like accessibility from the perspective of values favors a deeper understanding regarding the concept and the complex social context in which it is being considered. It contributes not only for a social responsible design of technologies as a process, but also as a product, favoring the design of solutions suitable to the target audience, its needs and expectations. In fact, values should be used as lens through which we look at the design context. The interested reader may consult [7] and [10] for further examples and discussions on the VP and other artifacts to support design activities.

5 Conclusion

Although recognized as important, there are few initiatives relating values to technology. In fact, there is even a lack of theoretically grounded approaches for investigating values and practical artifacts for supporting designers in their activities.

In this paper, we introduced the Value Pie as a comprehensive and useful artifact for guiding discussions on values in design. The Value Pie articulates different theoretical and methodological theories, favoring a comprehensive, informed and situated understanding of values and their cultural context. The theoretical and methodological grounds of the artifact are presented, and discussions and examples are presented in order to show how de artifact can contribute to a value-oriented perspective in HCI.

The Value Pie draws attention to the diversity of values, their cultural and interactive nature, allowing the discussion of values according to three different dimensions: culture, formality and interplay. The artifact may be helpful for guiding researchers, designers, analysts, and practitioners to understand values and dealing with them in the design of interactive technologies.

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