# Clarifying culture in technology design: what, why, and how we think about it

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## ABSTRACT

Culture influences our way to perceive the world, to interact with it. To inform technology design with cultural aspects, we model our reality in three levels: technical, where the artefacts are; formal, where existing rules shape our behaviour; and informal, composed by values, beliefs and other aspects that influence how we perceive the world. We can promote a social change, redefining a community, by introducing new technology at the technical level. This is how and why we understand the importance of culture in design. In this paper, we present an overview of our design perspective under the Socially Aware approach, and illustrate this understanding applied to two case studies of design informed by sociocultural aspects.

## Keywords

Human-computer interaction, Organisational Semiotics.

## 1. INTRODUCTION

In 1959, Hall [6] had already evidenced that introducing a technology is the most efficient way to promote changes in culture, and to redefine a society. Nowadays, we clearly see such impact in all aspects of life. The way we work, study, eat, interact to each other, understand time and space, and live, have been more and more mediated by Information and Communication Technologies (ICTs).

We understand the role and the impact of technology in life through the lenses of Human-Computer Interaction (HCI), a discipline that brings ethical issues transversally to Computer Science. The designer is the one assigned the responsibility to consider the human aspects, be they universal or contextual, when proposing a technical (and consequent social) innovation.

HCI has investigated how to bring cultural aspects to design from different perspectives and with different aims. It has been associated to usability evaluations [4][23], inspired HCI design methods from a cultural perspective [5][18][24], and discussed in terms of internationalisation/globalisation of user interfaces [10]. Some theoretical and methodological frameworks, such as Hofstede [8], Pereira and Baranauskas [13], and Salgado et al. [17], have been developed to support design activities. Even considering these influential references, recent literature claims that culture in HCI research has been guided by practical and specific problems and contexts, therefore, building a fragmented view [13][17].

Establishing a culture of informing ICT design with cultural aspects still demands effort that starts from revisiting theoretical and methodological grounds and practices. It is both a matter of action and perspective that require a shift in our position while researchers, scientists and practitioners, seeing the people prior to

the problem, the problem context prior to the technology, and the actual needs of stakeholders ahead of automating tasks. As important as including issues related to culture in the agenda of technology conception, design/development and evaluation, is the need to facilitate the recognition of these issues by professionals who are unfamiliar with the social sciences, supporting designers not only in what they have to do, but how they can do it.

"Culture", "Technology", and "Design" together have been deeply investigated and discussed from a multitude of perspectives. Through this position paper, we intend to add to this panorama our experience as case studies, highlighting some methods and artefacts created to facilitate the design considering cultural aspects, especially when designing a technology to promote a social change. To do so, we structure the paper in three main parts: i) what we consider as culture, ii) why we believe culture must be explicitly considered in any design process and product, and iii) how we have striving for that in our design practices.

## 2. WHAT WE CONSIDER AS CULTURE

According to Tylor [22], the term "Culture" emerged in 1871 as a synthesis of the terms "Kultur" and "Civilization", used to refer to all the spiritual aspects of a community and their material achievements, respectively. Culture, in its wide and ethnographic sense, represent the complex whole which includes knowledge, belief, art, morals, law, custom and any other capability and habit acquired by man as a member of society.

Hofstede's [8] perspective to culture is the most referenced in HCI. It relies on shared beliefs, values and practices of a group of people, as the collective programming of mind that distinguishes the members of one culture from the members of another. As Salgado et al. [17] argue, this approach assumes the existence of generalised cultural traits. If on the one hand it facilitates predicting the behaviour of cultural groups, on the other hand it does not favour identifying cultural aspects of particular context, such as communities.

Hall [7] argues that the natural act of thinking is strongly modified by culture, and believes that more important than looking at theories with specific focus, is looking at the way different aspects that influence our perception, behaviour and understandings are put together. Although it is useful to question about specific situations, understanding the cultural context in which people live, the way they interact, and their behavioural patterns can offer more information than looking at predefined hypothesis relating people and their perception of things in life.

In Hall's perspective [6], culture is understood as different ways of organizing life, thinking, and understanding basic assumptions about the family, the state, the economic system, and even the human being, acting as a link between humans and the mean to

interact with each other. Hall's approach is based on 10 (ten) Primary Messages Systems (PMS), or areas. He named the basic building blocks of culture as Interaction, Association, Learning, Play, Protection, Exploitation, Temporality, Territoriality, Classification, and Subsistence, arguing that any culture could be characterised, analysed and compared through a combination between these areas. Culture is then analysed as a form of communication giving emphasis on the non-verbal aspects (behaviours, values, intentions, needs, expectations, etc.). Learned behaviour patterns, attitudes, values and material goods are under a cultural context.

Hall [6][7] is then our main theoretical reference to bring cultural aspects to design. In our perspective, Hall's approach enriches the design context and favours designers to look at the world through the lenses of different stakeholders. For example: in [13], we drawn on Hall's theory to understand the cultural practices and views of Brazilian special education teachers, and then identified requirements to design a social network for them. And in [16], we applied the 10 blocks of culture to shape the analysis of cultural aspects related to natural environmental protection in Brazil. The analysis aimed at finding motivational aspects of using technology and perceiving natural environment, leading to general guidelines to design eco-feedback technology.

From our practical experiences, we argue that the contribution of a culturally informed perspective to design can go beyond an informative analysis, and should be somehow incorporated in the theoretical and methodological framework used to support design, transversal to any design process.

## 3. WHY WE THINK ABOUT CULTURE

In the mid-50s, Sharp [19] analysed 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 the tribe' productivity and quality of life, but an inevitable collapse of its traditional culture and values was noticed instead. This example draws attention to the impact of technology on the environment it is inserted and on people living there – even on those who are not directly the technology users. 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.

In different ways, contexts, and dimensions, technology has more and more impacted our reality. In many cases, designing a technology means assigning an intention to this impact. As stated by Baranauskas [2], there is no neutrality in technology design. A design can target making information more accessible (or not), persuade specific behaviour, promote collective actions, new worldviews, and so on.

When designing technologies, looking at the design problem through the lenses of culture may reveal important issues that are usually too subtle to be identified, such as external forces that influence how people perceive technology, what is (not) desirable and important for different stakeholders in the context, and why. These issues make a difference in the design rationale, supporting designers in their choices.

As recognised by Hall [6], we believe in the potential of technology to trigger and promote positive sociocultural changes. Developing new technologies that tackle social issues, and at the same time transform social interactions promoting new collaboration and relationships, the so-called and desired social

innovation [11], requires methods and tools to deal with different sociocultural contexts and to transform them into features or design elements.

## 4. HOW WE DEAL WITH CULTURE

Hall [6] points out that we behave in three alternating modes: informal, doing things as we learn in everyday life; formal, when behaviour is regulated by rules; and technical, with artefacts supporting behaviour patterns. In line with that, we draw on the metaphor of the Semiotic "Onion" [20] to assume that technical aspects in design are within a formal level, where rules regulate the way people act. The formal level is, in turn, immerse in an informal level made up of cultural aspects, where people's beliefs, values, and motivations are. The technical, formal, and informal levels influence each other.

Inspired by the Semiotic Onion, Baranauskas [2][1] understands design as a movement that starts in the society, crosses the informal and formal layers of signs, towards the construction of a technical system, returning and impacting the society (see the dashed ellipse in Figure 1). She characterises this approach as Socially Aware Design considering:

- It demands the articulation of meanings of a social group in their informal and formal levels for the co-construction of the system at the technical level.
- It recognizes the other, and their differences, as essential to a systemic view of the design of interactive systems.
- It recognises the communication between parties as a culturally defined social phenomenon and proposes artefacts to mediate this communication to ensure their creative and collaborative involvement in design.
- It recognises in the stakeholders the power to design and allows their creative and responsible involvement in design solutions.
- It is situated in a socioeconomic and cultural reality, without losing its location in the world.
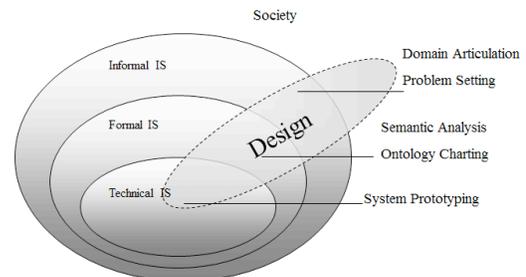


**Figure 1. Baranauskas' [1] Socially Aware Design model**

Understanding the socioeconomic and cultural reality means identifying the forces that are in play influencing the way people perceive the world, the way they interact with things and with others, their expectations, etc. Through the lenses of semiotics, one's perception of the world is subjective, relying on the triad composed by the person, the ecological system, and the signs in the world [3]. The Organisational Semiotics (OS) came out from this theoretical ground as a discipline that studies information and its functions in organised domains, such as a company, or the introduction of a new technology in society. OS provides methods and techniques for understanding and modelling information systems, considering social and human activities as part of this system [9][20]. The Socially Aware Design [2] relies then on the OS as the main theoretical frame of reference, and on Participatory Design as a methodological inspiration.

Targeting a social impact by means of technology requires broadening the understanding of the social issue not only in terms of potential users' skills and needs, but also stakeholders' main concerns, current patterns of behaviour, values, beliefs, and other sociocultural aspects that influence technology usage and adoption. OS provides methods and artefacts to address these analysis, such as the Stakeholder Identification Diagram, Norms, Valuation Frame, Semiotic Framework [9] as examples that support problem clarification.

## 5. CASE STUDIES

In this section we briefly introduce two case studies representing our practices under the Socially Aware Design. We highlight some artefacts and methods and discuss some of the findings.

### 5.1 Special Education Scenario

The first case study refers to the design of a social network called "Todos Nós em Rede" (All of Us Networked), which purpose is to connect teachers in Brazil supporting the socialization of their practices related to students with disabilities [13].

Within this scenario, we focus on the Value Pie (VP) artefact, applied to analyse social dynamics related to social media usage by the teachers. The VP [12] is a culturally informed conceptual scheme created on the grounds of OS [9] and the Building Blocks of Culture [6] that supports the problem clarification and context understanding from three different perspectives: Culture, Formality, and Interplay (see Figure 2).
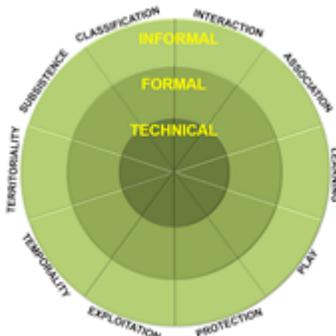


**Figure 2. The Value Pie [12]**

The artefact can be used both as lens to look at the design context from a wide yet structured social perspective and to understand specific concepts in a comprehensive and informed manner. When used to look at the design context, the VP warns designers to the existence of informal, formal and technical aspects (elements, attributes, behaviours, rules, values) related to the way the stakeholders interact (to each other, the environment, technology), associate, learn, play, deal with time and space, and so on.

When used to discuss specific concepts (e.g., accessibility, identity, privacy), the VP invites designers to think about the concept according to its different dimensions. One could imagine a concept "floating" through VP's slices and layers: although we tend to find a place where the concept is clearly manifested, we can see and discuss how it is related to the other layers and slices. In formality, designers will look at the given concept according to its informal, formal, and technical aspects: informal – the way different stakeholders understand and value it; formal – the (existing, new) social norms, laws and rules related to it; technical – the technical solutions, objects, materials related to it, or that need to be developed/redesigned. In culture, designers will identify the area (or areas) of culture where the concept is

originated, and in Interplay, they will reason about the possible influences it can cause/suffer from space, time, subsistence, learn, and the other areas of culture, and other concepts.

For instance, privacy may be understood as a cultural value developed in the Protection area, reflecting the importance of protecting personal information, ideas, things (exploitation), space (territoriality), etc. People have their own informal understanding for it, but also social norms and formal regulations as well as technical devices and materials to guarantee it. 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 analysed and cross all the VP's dimensions.

In the case study, for example, teachers did not express an explicit concern for privacy, they actually found good to share their opinion and information. However, when thinking on security they became aware of possible impact on their lives, or on their students' or students' families' lives, leading then to a reflection on privacy. This usually happens only when problem arises during the system usage. Therefore, the new system was conceived to guide users regarding privacy and security issues, informing teachers about the possible consequences of their actions, and instructing them not to share any content that could compromise their privacy or the privacy of others [13].

### 5.2 Promoting Energy Savings

The second case study summarised here refers to promoting a new "social affordance", or patterns of behaviour shared in a community [20][9], in the way people perceive collective energy consumption. The SEETree was the technical artefact designed with this purpose.

The SEETree is composed by an interactive system to set collective energy savings challenges, and a public and tangible feedback with led lights in the shape of a tree. Participants' performance in the savings challenge is reflected by lightening on the tree on progressively. The design targeted initially a low-income area in Brazil, triggering discussions around current patterns of behaviour and possible changes [14].

Different strategies and artefacts were applied along the SEETree design. Hall's 10 blocks of Culture based one of the firsts analysis [16], pointing out design directions such as the need to evidence the impact of individual actions to collective results. This lack of self-efficacy from people was identified in the Interaction, Association, Defense, and Exploitation blocks.

Sociocultural data collected via interviews with stakeholders and survey within the community were also analysed and mapped as Norms [15]. Within the OS context, norms are developed as collective affordances through practical experiences of people (agents) in the society, influencing how people perceive the world, make judgments, and possibly guiding their behaviour according to a subjective evaluation of a situation [9]. Norms have a proper syntax, as this example illustrates:

*<MOST OF TIMES, when in contact with people who do not pay for energy, THEN consumers*
*MAY believe that they should not pay for energy too>.*

This norm reflects the fact that stealing energy through illegal connections was somehow a culturally accepted behaviour. Other identified norms evidenced, for instance, that the traditional link between air pollution and energy generation/consumption adopted in eco design worldwide actually does make sense for that

community. People usually associate energy waste with wasting water due to the predominant hydro plant generation in their context. These analyses led to design elements such as associating energy waste with flooding new areas, and creating a space for people to freely discuss eventual illegal connections and collective consequences with no judgments.

This study considered the intentionally of the design in the process by modelling also the expected behaviour in the "intended reality" as Norms, as this example illustrates:

*<ALWAYS when involved with a collective saving energy challenge THEN users MUST understand the importance of individual contribution to collective achievements>*

The interested reader may consult [15] for further examples and the graphic representation of current and intended realities.

## 6. CONCLUSION

Considering cultural aspects when designing technology, understanding the impact of technology design and adoption, and investigating methods and artefacts to support these activities can be recognized as both a need and a challenge for all those interested in technology design. In fact, if we look at technology as a cultural construct transversal to human life, and if we recognise that interactive technologies permeate our lives, then this is a subject that directly or indirectly affects everyone.

In this position paper, we presented our view on the topic, developing a brief discussion on what we consider as culture in the context of technology design, why we think it is important to consider it in an explicit way, and how we have been considering it in our researches. We also illustrated our perspective to design with two case studies in different contexts applying artefacts and methods that reveal our theoretical and methodological grounds.

## 7. ACKNOWLEDGMENTS

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