7
Contributions and future work

This work is a Semiotic Engineering account of cross-cultural HCI design as the construction of a specific kind of metacommunication message. Our object of study was "the set of all computer-encoded conversations that the designer's deputy can have with users at interaction time" (de Souza & Leitão, 2009, p. 19) in single-user cross-cultural applications in the Web, seen as a matter of computer-mediated designer-user communication.

This chapter discusses the main contributions of this thesis in producing valid scientific knowledge and new research questions to advance the state of art in HCI. We examine which kinds of new knowledge were achieved, the main contribution to HCI in general, and the contribution to Semiotic Engineering in particular.

Section 7.1 discusses the general contribution of our work to HCI research in cross-cultural design. Next, Section 7.2 presents the specific contributions and consequences of this thesis to the current state of Semiotic Engineering as a theory. Finally, Section 7.3 presents opportunities for future work.

7.1.
Contributions to HCI research in cross-cultural design

7.1.1.
A Unified Theoretical Frame

Our general contribution to HCI is precisely this *new account of known problems* (regarding culture and HCI), stemming from a combination of theories – Semiotic Engineering, Intercultural Communication and Semiotics (see Chapter 2) – that have never been used before to this end.

The Semiotic Engineering ontology condenses the concept of culture into broader conceptual clusters like 'metacommunication' and 'user-system' communication (de Souza, 2005a, p. 95). However, it does not explicitly address the intercultural encounter between the designers' (senders) and domain's *culture*

when metacommunication (message) takes place. Neither does it explicitly address the encounter between the designers' and the users' culture in the conversations that the designer's deputy can have with users at interaction time in cross-cultural applications.

Consequently, by exploring the HCI design space as structured by this theory, we analyzed, dismembered and articulated the problem of 'culture' as a matter of cross-cultural communication involving designers and users. This is *per se* a contribution to HCI because the problem has not, to-date, been framed and dealt with in this specific way. By thinking analytically about culture in HCI (as structured by the Semiotic Engineering design space) we could see and separate concepts involved in the process of communicating aspects of cultural diversity in HCI, namely: interlocutors playing a role in cross-cultural single-user human-computer interaction; and kinds of intercultural encounters that may happen between them.

As mentioned in Chapter 3, although we have found initiatives to theoretical approaches to deal with cultural challenges in HCI (Zahedi & Pelt, 2001; Shen *et al.*, 2006), the most prominent HCI alternative for dealing with cross-cultural design are fragmented solutions framed as a set of guidelines for Int-Loc approach.

The main advantage of having a unified theoretical frame to deal with culture in HCI is that it allows HCI researches to see the big picture and, thus, to make use of theoretical concepts to think about the problem, to explain the investigated phenomenon and the effects of the design options, and to provide the connecting points between the matter they are deciding about with CVM (how to *organize* and to *structure* the interactive discourse in order to communicate their design intent to the users) and *other* dimensions of cross-cultural HCI design (like, for example, how to obtain and select cultural *content* to be communicated). As a consequence, when building interactive artifacts designers will have conditions to decide where, why and how to apply the knowledge gained when using CVM.

This Semiotic Engineering account of cross-cultural HCI design as the construction of a specific kind of metacommunication message proposed in this thesis has opened the avenue for at least two contributions to HCI. First, from this

vision various relevant research questions (addressed separately, so far) were formulated within this unified theoretical frame (see Chapter 2, Section 2.2).

For instance, the literature has some studies about the awareness of cultural differences in cross-cultural design and others about the impact of cultural differences between designers and users in HCI design process. Although these issues are related, they are currently addresses separate, so, the HCI researchers have to see and derive this relationship by themselves. All depends on their ability to make this association and to see what is relevant or not.

The preliminary mapping of cultural diversity design space based on Semiotic Engineering described in thesis, in turn, organizes these two questions regarding the cultural interlocutors involved in the communication process of culture: the designers, the system (the designer's deputy at interaction time); and the users (see Chapter 2). So, by using our perspective an HCI researcher may benefit from the theoretical account about the emission and reception of metacommunicative discourse by senders (designers) and receivers (users), respectively.

Second, our perspective allowed us to focus this doctoral research on a research question that had not been previously explored in the HCI literature: "**Which communicative strategies can we use when composing our metacommunication message about cultural diversity?**" And it also allowed us to explore a context where the design intent is to *expose* and to *explore* cultural diversity, rather than *conceal* it, as usually adopted in Int-Loc approaches. It was possible, since now the communicating process of aspects of cultural diversity in HCI includes the indirect intercultural contact, i.e., the contact between the users with the interface signs of another culture.

7.1.2. Cultural Viewpoint Metaphors

Our contribution to the current state of the art in HCI as an answer to the open question "**Which communicative strategies can we use when composing our metacommunication message about cultural diversity?**" is a set of conceptual metaphors (CVM), presented in Chapter 4. CVM-based design affects both HCI practitioners and users, since the design product will indirectly affect the

users, because of the choices, interpretations and appropriations made by designers. This thesis research investigated the designer's and evaluators' understanding and use of CVM (see Chapter 5). Why did we start with designers instead of users? Without knowing how *designers* themselves react to using the metaphors, and how evaluators trace the effects of CVM in actual designs, we run the risk of taking the consequences of sheer design talent for a sign of successful usage.

So, CVM contribute to HCI research in cross-cultural design, since they frame, organize and structure HCI designers thinking in at least two ways:

a) CVM separate possible questions regarding direct (user-to-user) and indirect (user-to-interface signs of another culture) intercultural contact in human-computer interaction. So, CVM help them focus on (and make informed decisions about) indirect contact among cultures mediated by interface signs *about* the involved cultures. We should again emphasize that this thesis is not dealing (yet) with direct contact between *people* from different cultures (as is the case in online communities, chats, etc.). We are dealing solely with the conversations that the designer's deputy can have with users at interaction time about cultural diversity

b) CVM segment the continuum of cultural approximation in five perspectives, each of them with distinctive characteristics defined by each metaphor. So, designers can explore different levels of progressive cultural approximation. Besides that, each metaphor defines how much the amount of help and scaffolds varies in relation to cultural approximation.

This segmentation, then, helps designers to take the overall view of the problem, so, designers can make decisions about whether and how it is appropriate to expose the users to content from other cultures while interacting with a cross-cultural system.

Furthermore, other contributions come from the structure promoted by CVM concepts:

a) CVM contribute to HCI research as an epistemic tool to support the elaboration of metacommunicative discourse about cultural diversity. The epistemic effect of the metaphors on cross-cultural design, i.e., as a

means to build new knowledge and understanding (Salgado *et al.*, 2011a) was evidenced by results from the case study about how they understand, conceptualize and reflect on their design goals and alternatives to achieve them (see Chapter 5).

By using CVM, HCI practitioners gained awareness of their own cultural biases and they reflected on their own position in the process of designing intercultural systems with the aim of promoting contact with foreign cultures. CVM also help HCI designers to think about intercultural contacts as a conceptual tool to explore and to communicate cultural perspectives in cross-cultural HCI design.

b) CVM may be used as base to formative and summative HCI evaluation, since they help HCI evaluators to inspect and to evaluate the communicability of cultural diversity (see Chapter 5 – Section 5.2.2.4). CVM also have the epistemic value of helping evaluators in interpreting their findings and reflecting on communicative strategies and new possibilities in cross-cultural HCI re-design.

The next section presents our methodological and theoretical contributions addressing this open question specifically in the context of Semiotic Engineering.

7.2. Contributions to Semiotic Engineering

This thesis works in a gap of the Semiotic Engineering theory (see Chapter 2). Although this theory considers culture as part of the semiotic process, this theory **does not** address the metacommunication elaboration of cultural diversity. This section presents the three main contributions of CVM to Semiotic Engineering theory.

First, CVM offer a way to organize the cross-cultural HCI design by dealing explicitly with a metacommunication in a cultural context. Our metaphors bring up the cultural interlocutors involved in cross-cultural single-user human-computer interaction by turning cultural differences into a topic of computer-mediated designer-user conversations. It naturally leads designers to position themselves more explicitly with respect to their own cultural values and beliefs. Reflection on one's own position in the process of designing cross-cultural

systems with the aim of promoting contact with foreign cultures is a confirmation of the reflective and epistemic effects of CVM as a contribution to the Semiotic Engineering account of HCI.

CVM also contribute by offering five kinds of communicative strategies organized in a single axis of cultural approximation which help designers to:

- reason about different levels of intercultural contacts while determining which cultural perspective they want to adopt;

- select and structure their top-level communicative strategy to stimulate users in increasing their perception of cultural diversity within the domain of the system;

- examine their choices guided by a single set of perspectives that can be used in intercultural contexts.

Additionally, CVM force designers to make decisions about strategies to structure communication of intercultural contact opportunities, independently of strategies to recognize and collect culturally dependent content to be delivered. As a result, they can reason about cultural communication and cultural information at different stages of design.

Second, CVM led us to propose an alignment of the semiotic characteristics that each metaphor suggests to communicate culture with theoretical semiotic elements from Peirce's typology of signs (1992-1998). Peirce's Semiotics helped us to analyze how different intercultural contacts promoted by CVM may cause different perceptions of cultural diversity.

This allowed us to characterize human-computer interaction more precisely and deeply, since we find out that the different intercultural contact promoted with CVM as well as their consequences to the users' perception about cultural diversity take place in accordance with Peirce's categories (iconic, indexical and symbolic representations) in the metacommunication elaboration of cultural diversity. So, the possible gradual effects on cultural diversity perception of different cultural mediation rhetoric regarding each metaphor led us to think about new classes of sign regarding culture (cultural unawareness, awareness, and experience).

The main contribution to Semiotic Engineering, thus, is the causal relation between the semiotic engineering (with iconic, indexical and symbolic

representations) according to CVM concepts and the potential consequences of CVM to the users' levels of perception and knowledge about cultural diversity.

Third, we are proposing CVM as an epistemic tool derived from Semiotic Engineering concepts as well as two HCI evaluation methods: the Communicability Evaluation Method (CEM) and the Semiotic Inspection Method (SIM). CEM (de Souza, 2005a; de Souza & Leitão, 2009) and SIM (de Souza *et al.*, 2009) were proposed as *epistemic tools*, since they "help professionals in developing reflective, interpretative, and analytical HCI design practices" (de Souza & Leitão, 2009, p. 23). However, CVM are different from them, since it is not a structured method such as CEM and SIM are.

CVM share the object of investigation of SIM and CEM (the metacommunication), nevertheless our proposal is not focused on investigation of the tree distinctive classes of sign (static, dynamic and metalinguistic) as CEM and SIM do. Instead, CVM try to contribute in helping evaluators to inspect and evaluate the communicability of cultural diversity by defining which metacommunication features are related to each metaphor.

In the next section we present our conclusions and opportunities for future work.

7.3. Conclusion and Future work

Cultural differences around the world raise the challenges of good HCI design. For a number of years the HCI community has been investigating alternatives to enhance the design of cross-cultural systems (Ito & Nakakoji's, 1996; Winschiers, 2006; Reinecke and Bernstein, 2007; Clemmensen, 2009; Irani & Dourish, 2009). Our cultural viewpoint metaphors perspective aims at helping HCI practitioners to think of how to expose and communicate the very idea of cultural diversity.

In addition to all contributions presented in Section 7.1 and 7.2, this section presents the opportunities for future work motivated and generated by this thesis. In order to organize these possibilities we present them in two categories: future work to improve/evaluate CVM; and, future work to expand/enhance the Semiotic Engineering account of cross-cultural HCI design.

7.3.1. Future work to improve and evaluate CVM

Results from a case study carried out to assess the metaphors' potential for informing and improving the design and evaluation of cross-cultural applications reveal their reflective and epistemic effects (see Chapter 5). This motivates us to carry out new empirical studies to explore the practical effects of designing cross-cultural systems with CVM on designers and users.

a) Empirical studies with CVM involving users

With the case study we have gained an understanding of how CVM lead **designers** to conceive of users primarily as travelers**,** while they were preparing 'the trip', that actually takes place at interaction time. Now, we want to see how users receive a designer's message built with CVM. Following from the travel semantic field brought by CVM, new research questions involving the users and designer's deputy arise as opportunities to future work:

- What's going on throughout the trip?
- Is the trip good?
- Can the user interrupt the trip?
- Can the user transit between the metaphors at interaction time?
- How can the user change the itinerary of the trip?

b) Empirical studies with CVM involving designers

Step One of the case study analyzed the designers' understanding and use of CVM in a re-design activity. The next step in this research is to carry out empirical studies with designers actually using the cultural viewpoint metaphors to achieve a very specific proposed intent. The results will be compared with designs produced without them to achieve a similar purpose.

Furthermore, results from Step One and Two revealed that designers faced some challenges in manipulating cultural variables, so, we have an opportunity for future work exploring the impact of cultural background of designers and evaluators on cross-cultural design with CVM.

c) A case study of a design process

The case study presented in Chapter 5 was focused on how CVM support HCI practitioners at redesign and evaluation time. Another case study

should evaluate CVM in a design process, where the design and evaluation steps are intrinsically connected and then, we could evaluate the process as a whole.

d) Studies to turn CVM into a structured method

This doctoral research aimed at exploring the scientific contribution of CVM. The surprise is that CVM were more useful than we thought, since results from the case study gave us good tips on how to turn them into a design and evaluation tool.

7.3.2. Future work to expand or enhance the Semiotic Engineering account of cross-cultural HCI design

Our research suggests a number of directions in which theoretical work in Semiotic Engineering can proceed. The most relevant ones are:

a) Studies with CVM in combination with other methods of Semiotic Engineering

Results from the case study (see Section 5.2.3) also opens up opportunities for future work to evaluate the CVM with CEM to identify possible relationships between the metaphors and communicative breakdowns. Can CVM generate new communicative breakdowns categories? How to detect communicability breakdowns with CVM?

Another possibility is to investigate how CVM can be used in the procedural steps of CEM and SIM as anticipated by some participants in the Case study with CVM. Furthermore we can see how to link the three classes of signs in the designer's deputy's interaction discourse (static, dynamic, metalinguistic) with the classes of cultural signs (cultural unawareness, awareness, and experience).

b) A characterization of the designers' cultural background in order to trace its influence on metacommunication

More and more, design teams include people coming from different cultural backgrounds, not only in terms of their training but also in terms of their nationality. Therefore, in the process of building a *collective* metacommunication message for the users of a particular

application, there are certainly cultural factors influencing the way the message is delivered. One possibility that we see for future work that benefits Semiotic Engineering as a theory (and possibly HCI in general) is to use CVM to map out existing cultural perspectives *within* the design team, before the final metacommunication message is built.

c) Studies to investigate the alignment of the semiotic characteristics of each metaphor with other theoretical elements extracted from Peirce's typology of signs.

We discussed the alignment of CVM with elements of one classification (out of many) proposed by Peirce in his effort to provide a complete and consistent typology of signs. Future work in this direction includes an evaluation, through empirical studies, of how this can help designers in practical activities.

Other possibilities for future work lie in seeking for alignments with other classifications (for example, the one exploring how the representamen evokes the firstness, secondness or thirdness of the interpretant, rather than the object, talking about rheme, dicent and argument). We also propose that it might be particularly relevant for Semiotic Engineering to find out whether such alignments are only possible with cultural dimensions of metacommunication. Maybe they can be explored with other dimensions of a metacommunication, which would be a contribution to theorizing about metacommunication for users from the same culture.