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# The Silent Language of Materials: Gender, e-Textiles and Mayan Weaving

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**Abstract**

In this position paper, we present our reflections about a project in which we used e-textile prototypes to inspire dialogue and creative expression with members of a Mayan weaving community in Chiapas, Mexico. We encountered a complex and interwoven web of social, political, economical and gender issues that impacted our encounter. Our experience highlighted the importance of taking into account these dynamics, and especially the traditional gender roles that men and women have in this society and how it affects their relationships to materials and practices.

**Author Keywords**

E-textiles; Mayan weaving; Gender; Intercultural encounters.

**Introduction**

In recent years, a growing interest in the HCI and ICT4D communities has emerged towards the potential of new technologies and digital media to support the inclusion and integration of minorities and vulnerable communities within the larger society. Recent efforts have looked at the potential of digital fabrication and 3D printing [1], computer clubs and makerspaces [21], digital design thinking and co-design processes [5] and digital storytelling [19], among other practices and tools, to bring together communities and increase

inclusion and self-expression. In this project, we explored the potential of incorporating emerging computational location-aware textile materials into traditional woven Mayan artifacts, to engage traditional weavers in a creative conversation about identity, displacement and empowerment.

Clothing and textile are some of humanity's earliest and most effective technologies. We have been wearing clothes and accessories for thousands of years [20] and archaeological research has provided much evidence on how old and personal our relationship with clothing is. According to Marshall McLuhan, textiles "extend" our ability to adapt to different environments and have been essential tools for survival [14]. In recent years, rapid innovations in embedded and ubiquitous technology have made it possible for computational components to be woven into clothing. *Computational Textiles* or *e-Textiles* refer to computational systems that can be worn on the body [4], and include location-aware clothing and LED-embedded suites. E-Textiles (and wearable interfaces) are becoming more pervasive and are increasingly used by people from backgrounds other than engineering and digital design, including artists, fashion designers and even children [3, 10, 13].

Given this context, we were interested in combining one of the oldest surviving textile making traditions [17], the art of Mayan weaving, with some of the latest emerging e-textile technologies (i.e., embedded microcontrollers, sensors and actuators). We had several goals for this encounter: we hoped for the traditional weavers to explore the use and incorporation of these emerging components; we also wanted to explore the creation of new expressive pieces that bring awareness to the turbulent history of the region and

the identity of its peoples. We will present our reflections about the project in this paper.

## **Project Background**

We are an interdisciplinary, international research team with backgrounds in Computer Science, Design and Social Work and with a focus on intercultural collaboration. Discussions about the current project started as part of our reflections on previous projects we had conducted with sensitive populations in Mexico [8, 9]. In previous projects, we explored the potential of low-cost DIY prototyping digital materials to be incorporated into traditional craft practices [8]. When exploring these areas, we became aware of the capacity of computational textiles to engage diverse populations in creative activities.

In previous research, Katterfield et al. [12] showed that computational textiles that incorporate low-tech craft materials with computational components can encourage women to design personally meaningful projects. Through the process, the participants became more confident in their skills and gained a stronger sense of agency and self-efficacy through creating unique functional prototypes. The researchers argued that the "soft", not initially technical-looking character" of textiles and fabric is more inviting to diverse groups of users and allows for novel artistic expression. Qiu et al. have proposed the design of an entire computer science education curriculum using computational textile and wearable interfaces [18]. Their main rationale was that these mediums allow for the engagement of diverse users, including users more interested in design and aesthetics rather than implementation and coding. We decided that these technologies might have potential to engage not only



**Figure 1:** The setting for the project were remote Mayan villages in the Chiapas region.

novices, as previous research suggested, but also add to the repertoire of accomplished professional weavers.

Chiapas is the southernmost state of Mexico and is home to its third largest population of indigenous language speakers (after Oaxaca and Yucatan) [2]. Due to its proximity to Guatemala and other Central American countries, this region has received many waves of immigrants and refugees over the years, particularly during the Guatemalan Civil War (1960-1996), during which many Mayan villagers fled to Chiapas [15, 16]. In the mid-1990's the area became the site of the Zapatista social and political movement that to a large extent was formed around a struggle for more indigenous rights [16]. Despite its history of conflict, this area is world renowned for its handicraft and, especially, the art of Mayan weaving [20]. These factors motivated us to initiate a project to explore intercultural collaboration opportunities in this area.

### **The Silent Language of Materials**

One of our research team members has worked for several years with the women weavers in one of the traditional Mayan villages that are situated in the mountains of Chiapas. The women weavers in this village (to whom we will refer to as community partners for the remainder of this paper) have formed an association to promote their art and are recognized worldwide as masters of traditional Mayan weaving. Their work has been featured in several international exhibits, including at an exhibit at the National Museum of Mexican Art in Chicago.

Prior to our arrival in the village, our colleagues discussed the possibility of a collaboration with her contacts and they expressed interest in working with us

and brainstorming over potential artistic and design projects. They invited us to visit them for several days and to show them our prototypes and explore ways that we can work together.

We selected a series of characteristic wearable computing components (i.e., wearable microcontrollers, GPS units and LED lights), as well as, two prototypes that we wanted to use as design probes [6], to inspire and invite conversation and dialogue. The first prototype, HugBug, (Figure 2) consisted of a large hat embedded with LEDs that were activated when the hat wearer was hugged [7]. A second prototype was a piece of fabric that had a microcontroller and GPS unit embedded in it and reflected its location on a website, indicating "its travels" around the world. Additionally, we had other tools, such as Makey Makey's, Raspberry Pi's and a series of videos on wearable components.

Given the remote location of the villages, we organized several day-long visits with our community partners. During these sessions, we observed their weaving techniques, talked together about what weaving has meant to them and what are their plans for sharing their craft in the future. We also shared some ideas around how weaving and other craft traditions sometimes move and are transposed through (voluntary and non-voluntary) migrations. We related these ideas to some of our own experiences (one of our team members is an immigrant from the Middle East) of bringing our belongings, including family textiles that can represent family values or memories, to new homes.

Our community partners shared some of their knowledge of the diversity of weaving traditions in the

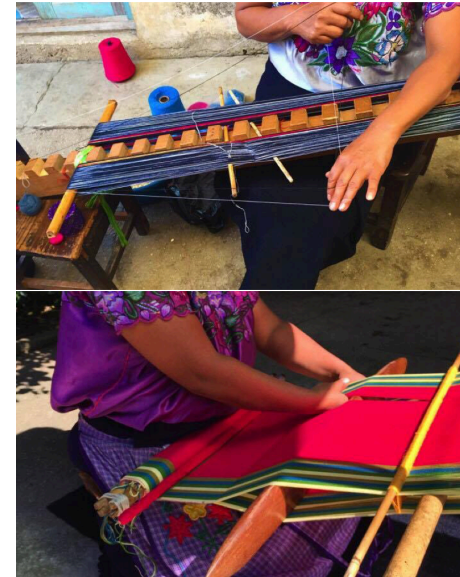
different villages surrounding their home village. They also examined our prototypes and looked at the wearable components with curiosity. However, they did not volunteer new ideas of how these materials or other digital components could be incorporated into their weaving. After initial enthusiasm on both sides, it seemed our discussions had come to a standstill.



**Figure 2:** HugBug - An example prototype (pictured here at a MakerFaire in Canada)

We shared a design concept about an artifact that we could co-design to raise awareness around issues of displacement and identity. The concept involved incorporating a GPS unit into a Mayan textile that could record its movement through different refugee and

migrant communities around the world. However, the idea was not taken up by our partners.



**Figure 3:** Examples of the traditional tools and techniques used daily by Mayan women weavers in Chiapas.

In post-meeting sessions, we reflected on what dynamics might have caused the difficulty in creative collaboration. We considered the complex socio-cultural setting of the project and identified several potential factors: 1) Our community partners' native language was Tzotzil. However, they easily communicated with one of our research team members (who also understands and speaks basic Tzotzil) in Spanish. 2) Because of their difficult history of outsiders who have visited the villages before for. However, our community partners had invited us to visit themselves and, from the outset, we had clarified the objectives of the project

and built a trusting relationship with them. 3) Finally, there were complex gender dynamics at play in the villages and men and women had very clear roles: the women were weavers and took care of the home, while the men were often farmers or worked in the city. Traditionally, men do not work on textiles and women do not handle digital or mechanical systems (other than the weaving tools, for example the ones shown in Figure 3). We decided to explore this last point further. We should mention that in our team the programming of the e-textiles was conducted by a male researcher.

Until the final day of our meetings, we had focused on discussing the prototypes and videos to the women. For one of the days, we conducted playful activities with the children that used some of the prototypes. While the men were present during our visits they did not take part in the conversations and were not explicitly invited to take part in the activities or examine the prototypes (although we would have appreciated their participation). On the last day, we showed the prototype to a small group of men who were family members of our community partners and present in the household at different times during our visit. To our surprise, one of the men immediately became interested in the project and started examining the prototypes, asking questions and suggesting ideas of how the components could be used.

He stated that he had taken some electronic courses at a local community college and was interested in learning more. He said that until that day, he had assumed that we were talking only about textiles and that we wanted to only collaborate with women. He was surprised that the electronic components were

embedded in textiles in our prototypes and expressed interest to take part in future conversations.

### **Lesson Learned**

Following, we present several lessons learned from our encounters in Chiapas and, for each, relate them to our experience and how they can be applied for work in other intercultural contexts.

#### *Materials matter*

A key insight from our encounter was that materials used in prototypes can silently signify different messages to different people: a textile artifact augmented with a microcontroller is a multifaceted object that brings together elements from separate worlds together. This complexity became apparent and amplified in our experience, as in the traditional Mayan social system the clear division of gender roles strongly suggested that electronic and computational components are associated with men's activities and textiles and soft materials with women's activities. Therefore, E-textiles presented a contradiction and a challenge that could either facilitate conversation or create barriers to inclusion and dialogue. A single prototype has a very limited capacity for challenging years-old traditions.

In future approaches, we would use much more background preparations before introducing e-textiles and make sure that we involve both men and women in the conversation from the beginning. Perhaps, we can introduce our community partners to electronics separately and after they become interested in them, introduce the idea of combining them with textiles. Additionally, we would be very selective about

prototypes used as probes and make sure they are culturally relevant to our partners.

This observation is relevant to researchers working with refugee and immigrant populations, as it underlines the importance of carefully examining the cultural significance of different materials and practices within the culture of the community members that they plan to work with.

#### *Strategizing based on cultural context*

Our experience made it clear that we needed better strategizing in terms of sensitivity to traditional gender roles in the community we were working with. While we had prepared for our encounter by studying the history and prevalent traditions in the community, as well as, establishing trusting and long-term relationship with our community partners, a plan to explicitly involve the men in the dialogue around the project might have opened new venues for collaboration and creativity.

This point is relevant in working with refugee and migrant populations where the cultural norms and traditions of the minority population might differ considerably from the researchers and strategies for inclusion might not be immediately apparent. In these cases, it is important to develop explicit protocols, such as clear invitation for different groups within the community, to encourage participation in the project.

#### *Finding common ground*

In our experience, discussing themes that our partners could relate to, namely family identity and its relationship to craft and art, that we ourselves also had personal experience with, was helpful in creating good rapport and common understanding. We believe that in

working with minorities, it is important to identify and stress things that bring us together, rather than set us apart. This focus on things that matter to everyone and are culturally relevant is important to the success of intercultural collaboration projects.

### **Conclusion**

We have complex relationships with materials and practices, relationships shaped by our histories and backgrounds. In this paper, we shared our reflections on how these relationships can impact the dynamics present within intercultural projects and how knowledge and understanding of a different culture inform our research and design practices.

We believe considering these relationships are particularly important for projects that aim to increase the inclusion and empowerment of vulnerable populations within the wider society.

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