

## **On the Role of In-situ Making and Evaluation in Designing Across Cultures**

There is growing interest in designing products and interactions across cultures. In this paper we report on our attempts to use in-situ making and evaluation to facilitate a short co-design process with outside designers in an ethnic and rural community. We found that rapid prototyping in the local context provided a mechanism to quickly engage designers with locals in informing iterative design refinement. Our research suggests that using in-situ making interlaced with evaluation is a feasible approach to drive designers to immerse, exchange and design within a cultural different context in the early stage of design exploration. We found that the rapid nature of our process makes it more suited for cultural product design led by designers than cross-cultural design.

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### **1. Introduction**

Makerspaces and DIY maker practices have become an emerging site of HCI innovation (Lindtner, Hertz and Dourish 2014) to which people have attached ideals of hopeful cultural intervention (Lindtner and Lin 2017) to support and sustain cross-cultural design and culture exchange. Furthermore, the materiality of making offers a space for “reflection and to facilitate the ability to be creative, explore, reflect and express in a subtle and gentle way” (cf. Reitsma, Light and Rodgers 2014) which is beneficial in the early stage of design, especially across cultures where the materiality “does not require language to clarify messages” (ibid.). Making involves construction and transformation of meaning that both designers and other participants can engage in and may help to address some of the challenges of cross-cultural design (Sanders and Stappers 2014).

However, making faces significant pragmatic challenges across cultures, not least the need to respect socio-technical and politico-economic contexts and realities (Sun et al. 2015). Furthermore, practical implementations in rural locations with a set of digital, low-cost and robust making techniques are very challenging. Finally, the imbalance of contribution and knowledge between designers and locals may lead to different views of participation which are at times both ambiguous and conflicting (cf. Sabiescu et al. 2014). Given these challenges we are interested in how making can be used as a driver and facilitator for design across cultures in rural areas.

The study reported in this paper was conducted with the Kam local minority group in Tongdao, a remote and ethnically distinct county in central southern China with a rich indigenous culture and traditions. It is a part of the long-term engagement with the local community in the New Channel programme which has been undertaken since 2009 (Wang et al., 2016) within the DESIS initiative (Design for Social Innovation and Sustainability; Manzini 2011) network in China (Ji et al., 2014). Various projects have been undertaken over the years to empower local communities and treasure their culture from revival of local brocade production with modern designs (Wang et al., 2014) to co-creating an interactive drama with local stories (Bryan-Kinns et al., 2018). Meanwhile, the local culture is in flux as a result of waves of migration to cities and the Chinese government's plan to eradicate poverty by 2020 and build a 'harmonious society' (cf. Sun et al. 2015). Just like other emerging economies, the rapid change and development of local society mixed with the infrastructural transformation of China bring challenges to local culture. For example, recently most local businesses adopted mobile payment systems almost overnight because 4G mobile data became readily available where there was no internet just a couple of years ago. These radical changes bring fresh waves of outside culture through the internet and in person through

tourists, business, and e-commerce. Given the designer's role in the transition of society (Margolin and Margolin 2002), our motivation becomes to engage more designers and design students in embracing local culture with their creations and in doing so benefit the local community from their activities and interaction. As with Brereton et al. (2013), the interest of the local population is to "embrace the opportunities and challenges of the modern world" by maintaining a firm footing in their traditional culture and modern Chinese culture and to "seek to exploit technologies in order to do this".

1.1 Culture in Design Cultures play a crucial role in design and evaluation and yet there are ongoing debates about what culture means in design, geography, and society. Julier (2006) used the term 'design culture' to capture both something that designers do, and something that is 'all around', which is different to the notion of culture in geography and ethnicity (Mitchell 1995). In keeping with Brereton et al. (2013) we take 'culture' to mean "the way of life of a group of people. . . . Particular design questions and participating groups tend to bring into focus different cultural perspectives". To bridge cultural barriers, Participatory Design (PD) has been widely adopted in designing with marginalized people in developing regions who foreground ethnic culture in contrast to a design culture (Hussain, Sanders and Steinert 2012).

The sheer diversity of local contexts has inspired design and engaged designers across the design spectrum from cultural and creative product design (Moalosi, Popovic and Hickling-Hudson 2010), community-based information systems (Caroll and Rosson 2007) to social design (David, Sabiescu and Cantoni 2013). Cowen (2002) proposed that the benefits of cultural exchange usually come from dynamic settings with great imbalance. Mulgan et al. (2007) presented a *connected difference* theory that co-creation with rural communities results in qualitatively different experiences and outcomes than co-creation as practiced within technologically fluent and culturally

similar communities. This difference is reflected in the distinction between *cultural product design* (Hsu, Lin and Lin 2011) which has been used to describe the modern design influenced by traditional regional cultures, and design that happens in the intersection of different cultures which has been referred to as *cross-cultural design* (Winschiers-Theophilus, Zaman and Stanley 2017). This paper's research interest lies in how we can develop making practices to bridge across design culture and local ethnic cultures.

### ***1.2 Methods for Design with Local Culture***

Inspired by a rich local context, design necessarily requires efficient mechanisms to immerse outside designers in local culture and traditions, and to transfer these cultural elements to novel design concepts. Traditional field studies such as ethnographic methods (Hughes et al. 1995) and remote methods such as media diaries and cultural probes (Gaver, Dunne and Pacenti 1999), have been employed to acquire cultural knowledge. However, passive engagement with the local context often limits the co-design across cultures and regions (cf. Soro et al., 2016). Brereton et al. (2013) suggest that by building on familiarity design teams could engage local expertise and cultural knowledge and demonstrate technological possibilities in concrete and culturally relevant ways, and Soro et al. (2016) suggest cross-cultural dialogical probes where design “inspiration and insight comes from dialogue”. An empathic understanding between designer and local community is crucial in such approaches (cf. Reitsma, Light and Rodgers 2014). Le Dantec (2010) argues that it is critical to use external objects to express knowledge and to build a shared representation between designers and participants.

One of the key challenges of cross-cultural communication is the need to spend significant time building cross-cultural relationships and understanding (Brereton, Roe

and Hong 2012). Winschiers-Theophilus, Zaman and Stanley (2017) suggested building consistent collaboration between research institutes and local communities. In our case, relationships with the local community had already been built through several years of collaboration through the New Channel programme outlined earlier, but the key challenge remained of how making with culture exchange could help first time visitors co-design with the local community. Pragmatically, the very early fuzzy front-end of design (cf. Sanders and Stappers 2008) is often critical to the success of co-design processes.

Hussain, Sanders and Steinert (2012) proposed that the early stage of co-design should be led by outside designers as they noted that it very hard to facilitate true co-creation in this stage. However, local people's ambiguous understanding of outside designer initiated design can lead to a lack of local participation (cf. Reitsma, Light and Rodgers 2014). Care must also be taken as local ethnic cultures are also impacted by design culture which in turn influences the way ethnic culture is shown to designers (Grant and Fox 1992). To explore these issues further this paper focusses on methods for visiting designers to quickly immerse themselves in local culture and appropriately exchange design culture with locals through making.

### ***1.3 Research Questions***

Given these issues, this paper explores a case study of a maker space we built in Henglin, a village of the Kam ethnic religion in China, which was used to create interactive prototypes inspired by local culture. We refer to this making as *in-situ making* which is similar to other research on cross-cultural and co-design approaches such as Reitsma, Light and Rodgers' (2014). Our paper's contribution is a demonstration of how such approaches could be used to inform rapid in-situ prototyping

of future tangible interaction products, reflecting the trends in the emerging maker community, and culture exchange.

Focusing on the early stage of design, and exploring in-situ making's suitability for culture product design and cross-cultural design our research questions are:

- (1) What might designers learn from local culture and traditions in their interaction design exploration based on in-situ making and evaluation? (RQ1)
- (2) How might early stage co-design encourage culture exchange in the in-situ process? (RQ2)
- (3) How might the in-situ process be facilitated in local context? (RQ3)

## **2. Case Study: Designing Music Boxes inspired by the Kam**

In the case study presented here, a group of nine outside designers were tasked with creating a new digital music box inspired by the local cultural context. The 'music box' topic was selected well in advance of the in-situ making as a playful design exploration (cf. Fallman, 2008), bringing together two cultural design traditions: i) outside cultural elements of music boxes and digital making; and ii) local cultural elements to be found in-situ.

The local Kam community's culture is unique and provides a rich cultural context which would be unfamiliar to people from outside Tongdao, such as their crafted brocade (see Figure 1a), their woodworking and wooden buildings with exquisite structures (see Figure 1b) and covered bridges (see Figure 1b), as well as their ethnic music and related instruments, such as the bamboo Lusheng (see Figure 1c) and stringed Pipa (see Figure 1d). Meanwhile music boxes derive from Western musical culture dating back to the 1700s in Europe (Ord-Hume 1995) which would be familiar to most outside designers, but have not existed in the local traditional culture.



*Figure 1: The local cultural context.*

### ***2.1 The Method, Process and Outcomes***

The designers were split into four teams and included: one North American, five Chinese, and three European. We categorised their knowledge and background in Table 1: a) Background and lifestyle, b) Technology level including physical computing and digital making skills, c) Design expertise level in interaction and product design e.g sketching and form making, and d) their understanding of Local culture based on their prior experience.

*Table 1. The co-designers' cultural and knowledge background.*

Team No.	Name	Background and lifestyle	Tech. level	Design level	Local level
Team A	Nick	foreign	<i>e</i>	<i>e</i>	<i>m</i>
	Jenn	foreign	<i>e</i>	<i>e</i>	<i>n</i>
Team B	Alessia	foreign	<i>e</i>	<i>m</i>	<i>n</i>
	Yi	domestic	<i>n</i>	<i>e</i>	<i>e</i>
Team C	Meng	foreign and domestic	<i>e</i>	<i>e</i>	<i>m</i>
	Xiang	domestic	<i>n</i>	<i>m</i>	<i>n</i>
Team D	Lucia	foreign	<i>e</i>	<i>m</i>	<i>n</i>
	Ting	domestic	<i>n</i>	<i>m</i>	<i>m</i>
	Tong	domestic	<i>n</i>	<i>m</i>	<i>n</i>

*Abbreviation: n means novice, m means intermediate, e means expert.*

The whole process lasted 10 working days and included two days of cultural immersion followed by a rapid design process from ideation to implementation. To structure the immersion in the local context participants were asked to identify local examples of: i) cultural elements; ii) physical forms; iii) forms of interaction; and iv) sounds, and then to consider how they might use such features in their designs. The design process was structured as a complete design cycle including *ideate – design – build – evaluate – refine* so that we could explore whether this would be feasible in the restricted time and local context. A temporary makerspace was built in the village in advance to support in-situ making, including microcontroller kits, electronics, and manual hand tools.



The final deliverable could be any kind of interactive physical artefact which had the following properties:

- (1) It should be inspired from local culture (to draw on the local context and traditions);
- (2) It should somehow produce sounds (to draw on the music box traditions);
- (3) People should be able to tangibly interact with it (to emphasize the materiality of the interaction)

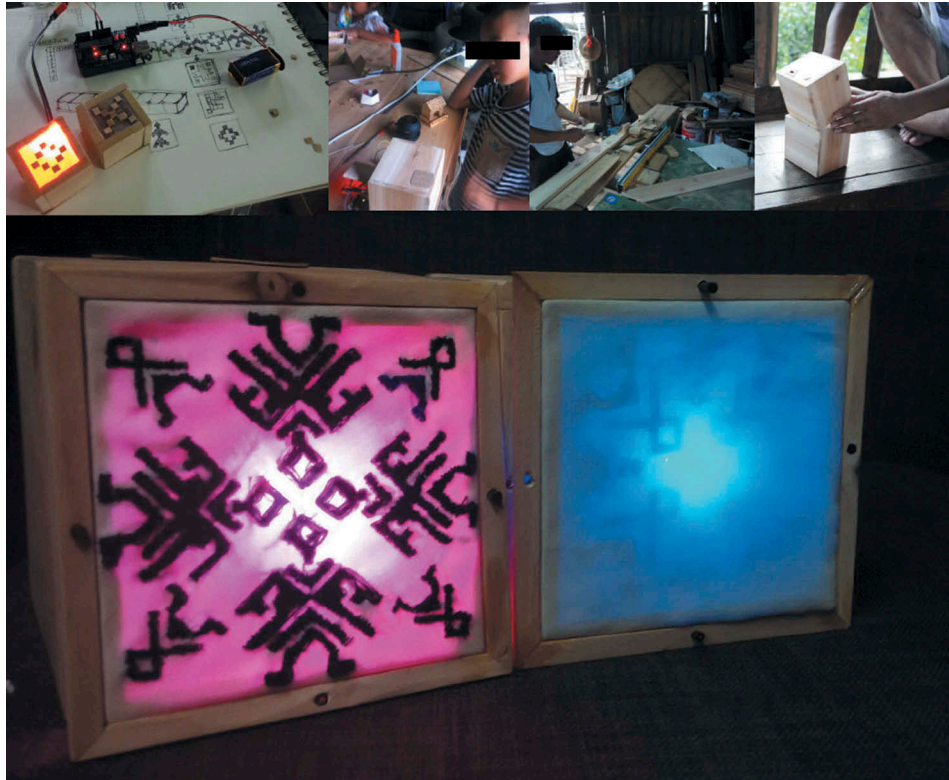
Four teams developed one artefact each as described below:

**'8bit Memento'** (by team A, Figure 2) is a bamboo tube-shaped keepsake decorated with local brocade patterns. The form was inspired by the bamboo echo tube, one of the most popular local children's toys, and also the eaves of local buildings. It embeds a Metro Mini (Arduino compatible microcontroller), tilt and light sensors, an 8x8 LED matrix, an Adafruit sound board and speaker inside. It was designed to use the action of tipping the tube to play sounds recorded from local nature, including the river flowing and the waterwheel creaking. It also allows people to peek into the tube to see a moving digital pattern inspired by local brocade. The sound and visuals were selected to trigger local memories from team A's cultural immersion.



*Figure 2: The work '8bit Memento'.*

**'Doye Boxes'** (by team B, Figure 3) is a pair of wooden cubes which act as tangible sound toys. The word Doye means 'come together' and originates from community dances and a sense of unity of spirit in local culture. The top of the box is covered with cloth decorated with patterns that symbolize the human form from four directions inspired by local brocade designs. Playful interactions such as putting two boxes together, or turning them over, or touching different sides, cause the boxes to play different Doye songs recorded locally. LEDs are embedded in the cubes to enhance the tangible interaction by projecting multi-coloured light onto the cloth top of the box.



*Figure 3: The work 'Doye Boxes'.*

**'Dong Tunes'** (by team C, Figure 4) is a windchime-like decoration covered by yarn-knitting. It is designed based on the form of a local craft *lucky flower*, which is a blessing token traditionally hung in the beams of symbolic buildings for good luck. Keeping the original form, team C worked with local elders who daily made the traditional lucky flowers to re-design the graphic patterns and colors of the new design inspired by local costumes and lifestyle. It is designed to use turning, twisting and tilting gestures to play embedded songs, narration and stories recorded from local elders during the making of the traditional lucky flowers.



*Figure 4: The work 'Dong Tunes'.*

**'Dong Shine'** (by team D, Figure 5) is a portable lantern which plays gesture-controlled music. The form is a reused bamboo strip-woven creel which was found during team D's cultural immersion. The design rationale is that it creates an opportunity to reuse discarded fishing creels which are plentiful in local to create a new function for local people. Dong Shine was created in response to local's enjoyment of playing music with loudspeakers whilst walking and the local need of lighting during walking in dark countryside evenings. It is designed to use knocking and waving as the basic interaction to control music. The decorative patterns on the outside come from local stories seen on rice-paper lanterns.



*Figure 5: The work 'Dong Shine'.*

Two exhibitions were held after the design process was complete: one in Changsha, a city in the same province as the village, and one in London, UK. These offered the opportunity to collect different audiences' feedback on the artefacts to compare these with local feedback.

## ***2.2 Reflections on the Design Process***

Our reflection on the design process is based on the authors' observations and interviews in the field, and a retrospective focus group with all designers which explored how they collaborated to make the artifacts, the design process, and their local experience.

### *2.2.1 Partnerships in Teams*

To provide context for understanding the working relationships of the teams we briefly reflect on the configuration of each team. Both members in team A were experienced in technology and design, had the most similar backgrounds, and shared the most equal design partnership. In comparison, team B's collaboration was more like a collaboration between artist and technologist (cf. Jones 2005) in that Yi (the artist) sketched the initial idea and developed the interaction with Alessia (the technologist) who provided the technical skills. Based on a more open partnership with the local community in team C, Meng focused on technical implementation and Xiang on material preparation and production. Team D took a centralized collaboration model with Lucia handling the direction and most key tasks with partners and assembling all parts together.

### *2.2.2 Working with the Local Culture (RQ1)*

Each team had different strategies for leveraging the local culture and resources, which were reflected in their final artifacts. Team A mainly used local natural elements such as bamboo and natural sounds. They extensively explored local surroundings, noted their ideation and meditation during walking journeys. Team B focused their attention on local arts, adapted local patterns from traditional brocade and paper-cutting to decorate their creation, and also took the shared meaning of Doye as the key element of their boxes after they attended a local music show. Team C embraced the local community by successfully building mutual trust with a local elder ladies' craft community who not only taught them craft skills and stories of lucky flowers, but also directly co-created the forms and audio. Team D paid more attention to reusing local materials, taking a bamboo strip-woven creel out of its traditional usage and giving it the new form and function, mixed with their observations of local needs of lighting and playing music during night walks.

### *2.2.3 In-situ Evaluation (RQ2)*

Team A offered their final works to groups of passers-by in a local covered bridge which is also a social networking place for resting and chatting, and took it into the rice fields to entertain farmers when they took a break. Such kinds of informal social ‘hang-outs’ gave them a good opportunity to collect natural feedback in-situ. For example, most people were attracted by 8bit Memento but found its interaction too obscure to understand thoroughly. Team B conducted their evaluation during several social occasions: a group of young men resting in a pavilion; several children and child-minding ladies playing in the river side; and the elders playing cards in a drum tower. They found quite different attitudes toward their Doye Boxes. Children and youths could understand the interactivity better and felt the tangible interactions were more appealing than the elders did. Team C collected their feedback in two parts, firstly interviewing six local people in their home village, and then taking their artifacts to the nearby village to interview three domestic tourists who came from urban locations. Domestic tourists gave quite high evaluations of Dong Tunes since they found it quite interesting to listen the lucky flower’s story when they played with it. These interviews led team C to identify different design opportunities for domestic tourists and local people which was not identified beforehand. Team D mixed the evaluation with their making process, testing their first prototype by showing it to locals on the evening of the sixth day, then the afternoon of the seventh day, and finally the evening of the ninth day in different sites.

### *2.2.4 In-situ Making (RQ3)*

Even though quite a lot of making took place in the temporary makerspace which was similar to a workplace in a modern environment (with power, WiFi, workbench and whiteboard etc.), making also happened in surrounding work places and even in the

wild. Nick in team A learnt bamboo making skills from a local senior bamboo weaver from a neighboring village, and used it in 8bit Memento. Yi found another carpenter workshop in the same village and employed their machines to fabricate her work, and also got suggestions for sound effects from local carpenters. Team C moved their workplace to the local elders' club and combined their Dong Tunes work with local ladies' regular afternoon craft sessions, and used materials local people had brought from their homes. Team D completed most of the making of Dong Shine in the makerspace surrounded by local children and youths who were attracted by the novel items from outside such as the 3D printer and Arduino kits. These local people then played the role as the first users of everything created in the makerspace.

### **3. Discussion**

First we reflect on how our findings reported above compare to Brereton et al. (2012)'s work with Warnindilyakwa which we share similar aims and design philosophy, then we discuss how our findings shed light on three research questions in this paper.

Both Brereton et al.'s approach and ours value practical projects above approaches such as workshops or probes as opportunities for "noticing each other's different ways, and helping each other out" (cf. Brereton et al., 2012). As outlined above, our in-situ making approach is different to the more informational and content based approach of Brereton et al. (2012) - in our approach the designs were inspired by local culture and critiqued by locals, whereas Brereton et al. (2012) also included content generated by the local population. Our aspiration would be to further develop our in-situ making practices to engage local populations with more of the hands-on making as we did in (Bryan-Kinns et al., 2014). In contrast to Brereton et al. (2012) who ensured that "non-Anindilyakwa members of the project undertook a cross cultural course", we relied on our in-situ makerspace as an open learning environment which



facilitated groups' exploration and reach out to the local community. Moreover, because the local Hengling population were quite familiar to face outsiders from previous visits they were free and eager to hang out in the maker space and explore what is new with this visit. Providing cross-cultural courses may provide a quicker means for outsiders to engage with the local population, but we believe it risks overly proscribing the cultural elements that should be attended to which we prefer to allow to emerge through ad-hoc in-situ interactions. Also in contrast to Brereton et al. (2012), in our study we did not start with existing local design materials such as "Ayakwa newsletter and maps and videos", but rather with an open design topic of cross-cultural music box design. Again, this was because we wanted to encourage in-situ design research and exploration which we hoped would foster mutual culture exchange between outsiders and locals. Both works valued working with local ideas and design as a core value of both approaches which encouraged community engagement and culture exchange, though our work favoured traditional crafts and stories for an artistic exploration in contrast to Brereton et al. (2012)'s more pragmatic and informative approach. Finally, both projects found that through their co-design processes the designers/researchers were both able to capture and present in a new and engaging way. Although captured in different media (Brereton et al.'s noticeboard and our interactive objects), both approaches created artefacts which became mirrors for local people to reflect on their own culture, for example providing opportunities to "better impart and share their culture with the youth" which were concerns raised by both communities. However, our case study was of shorter duration than Brereton et al.'s meaning that we relied on our background programme (the New Channel) to sustain the overall relationship between outsiders in general and the local population rather than particular in-person connections which reflects the difference in maturity of the two projects.

### **3.1 Learning from Local Culture through Design (RQ1)**

The agile cycle of in-situ making and evaluation provided chances to iterate the designs to further embrace and learn from local culture and sensibilities and to gain design insights from local community. For example, in terms of form, beside the suggestions about sound design received from local carpenters (as discussed above), team B elicited specific design feedback from locals including that the cultural elements should be presented on more sides of the Doye boxes, for example, wood carving animal shapes to decorate the box. For team B the input from locals became more fluent after they built empathic understandings (cf. Reitsma, Light and Rodgers 2014) of their design intentions. Moreover, after locals found that team B adopted their initial suggestions, they provided more suggestions such as the form factor would be better as an octagon (like a drum tower) or the shape of a local musical instrument. Similarly, team C received direct critique of their chosen colours and found that locals strongly preferred traditional colours for the interactive artefact whereas outside designers had no strong preference.

Insights were also gained about ways of interacting with the artefacts through evaluation of early prototypes during making which combined cultural familiarity with technological possibilities (cf. Brereton et al. 2013). For example, Team D found from evaluations with locals that their initial design for the interaction which was to play sound when the lantern moved (as lanterns often moved in the breeze in the village) did not entice interaction for locals. Instead, the interaction was redesigned to be controlled by waving of the hand near to the lantern which was more easily understood. In this way the physical forms and tangible interaction of prototypes provided opportunities to acquire different (more hands-on) local wisdom than might be gained from other approaches such as ethnography. Alessia (team B) commented that, ‘with the limited time and understanding cross languages and cultures, you must make and show some

tangible things with them, like the box or lamp, to engage local'. Similarly, Team A found that their initial gesture design (looking in to the bamboo tube) for activating the sound of 8bit memento was counter intuitive to locals who would prefer tipping the bamboo tube as if pouring water from it. Also, a senior bamboo maker's familiarity with bamboo materials in combination with the technological possibilities demonstrated early prototypes prompted him to suggest creating a rolling LED matrix similar to his experience of the display of lyrics of karaoke DVDs. Comparing with other approaches in starting such as Brereton et al. (2012)'s cross cultural course, our method could directly benefit visiting designers to learn local culture and attitudes actively and absorb them in their design.

One of the advantages in our in-situ design cycle is that evaluation was interlaced within the making which provided iterative refinement with local community feedback. Alessia claimed further that 'We need show certain prototype created in local (compared with taking a strange thing from outside). Then they could have more interests to interact it, develop further and tell us more'. In this way our approach differs to methods such as cultural probes (cf. Gaver, Dunne and Pacenti 1999) which seek to elicit design insights through prompts and observations – our iterative evaluation informed our design thinking in-situ. In this way our findings resonate with those of Soro et al. (2016) who found that "discussion of the concrete prototype, reveals not only feedback about the design itself, but also enlightening discussion about many aspects of culture that surround its potential use or non use". As with Reitsma, Light and Rodgers (2014) the materiality of our tangible designs provided opportunities to engage in design discussions around objects with limited conversational exchange.

The rapid nature of the in-situ design process and the need to quickly develop the interactive elements meant that the resultant designs became more like *cultural*

*product design* than *cross-cultural design*. That is, there was often a focus on the technical aspects of developing the interaction which meant that the resultant design work was inspired by the local context rather than being an equal intersection of different cultures.

### ***3.2 Culture Exchange with In-situ Making and Evaluation (RQ2)***

Initial culture exchange happened intentionally as part of the teams' work plan, as Meng (team C) mentioned, 'We prepared some little presents (for the elder ladies). They became quite open and nice when they found we are really eager to learn (how to make the craft), then talked a lot. So the connection was built.' Others happened serendipitously through casual participation, like the collaboration between team A and the bamboo weaver mentioned previously.

The in-situ process also provided designers chances to embrace unpredictable cultural inputs in their early stage of co-design. As Lucia (team D) pointed out, 'it totally depends on every team's luck in the first days that what kind of things and people you met, and what kind of local materials you could find'. For example, Meng (team C) noted how they created Dong Tunes,

At the first day arrived local, I was impressed by local architectures. We decided make a music box like the form of drum tower. We designed different forms but could not find one satisfied. In the next day, Xiang (the partner) and I hung out and visited a local elders' craft studio. When we first time saw the lucky flowers hanging under the roof, I realized what we want is just it. I immediately thought tilt sensors and rotation sensors (for more interaction). We discussed the idea and acted it with people there. Xiang think so too. So being there really help us design it.

This illustrates the uncertainty of starting with in-situ making as well as how it can quickly engage designers with each other and with the local culture to inspire

locally sensitive design and encourage design reflection with cultural immersion across their different professional backgrounds.

As Appadurai (1996) noted, culture is continuously reterritorialized which results in the texture and experience of the local context being altered through the unique interpretation and adaptation of external influences. In our case, the outside design culture caused local people to reflect on their ethnic culture from the viewpoint of modern design. In their collaboration with local elder ladies, Xiang (team C) reported that, ‘we liked certain lucky flower pattern they made by wrongly counting the numbers of threads. They actually didn’t like it and put aside. But then they thought our opinion (as outsiders’) should be regarded if they make tourist souvenir.’ As with Reitsma, Light and Rodgers (2014) we found that Team C’s working with traditional objects rather than outside design driven ideas engaged the local population deeply in the design process i.e. “community members started to envision how the entire design could be adapted to their culture by using an instrument [the lucky flower] that was central to important traditions”.

We also observed a pattern of *residual-turned-emergent* cultural evolution (cf. Chuenrudeemol, Boonlaor and Kongkanan 2012). For example, local people said that they felt quite proud when they saw that their Doye dance inspired interactive works by team B, and that their children were then interested to play with it who might otherwise spend all their time on their smartphone. This may benefit the local community in thinking about possible evolution of their cultural identity through digital technology.

Further examining local people’s attitudes to the design outcomes we found that even though locals could identify Kam’s patterns and music in the artefacts, and knew that we just created them in local, most locals supposed that these things came from outsiders’ world rather than being created indigenously. As Alessia (team B) noted,

‘local people like the music box they played. But they don’t think it belong to local life’. An interesting comparison is that most outside audiences in the exhibits in Changsha and London considered these artefacts to be a modern creation from Kam culture with digital elements. In this way the artefacts generated different responses between local and outsider audiences, but both saw them as exotic from their perspective. This suggests that the cognitive space constructed through our participatory design approach was a hybrid or third space (cf. Muller 2002) embodying the notion of ‘connectedness’ from two standpoints (cf. Sabiescu, et al. 2014) – it is neither local nor foreign, but somehow between the two. However, whilst there were elements of third space the connection to local culture was in many ways superficial relying on local culture for ornamentation rather than conceptual design. For example, 8bit memento (by Team A) which was drew on observed brocade patterns and use of bamboo tube was seen as too ambiguous and abstract by local population. It reflects the lack of equal participation from locals in most teams that the early conception was initiated by designers. In contrast, Dong Tunes (by Team C) perhaps had the greatest connection to local culture through the reuse and modification of both traditional motifs, narratives, and craft techniques. This depth of connection may have been formed through the deep connection built between the designers and locals in working in-situ on the lucky flowers in a similar way to the researchers such as Brereton et al. (2013).

### ***3.3 Facilitating the In-Situ Process in the Local Context (RQ3)***

The design process in this study was led by outside designers and local participation was voluntary without any monetary compensation. Even though this project forms part of a long-term collaboration with the local community, we found local motivation to participate was unclear and uncertain, and not at an equal level as the designers initially expected. As Lucia (team D) concluded, ‘after all, it wasn’t their business. They thought

they are just doing a favor for us'. With long-term participation fatigue through several years, casual curiosity and communication with new outsiders were the predominant motivation for local people to get involved. As Alessia (team B) claimed, 'they involved here just for fun, got chances to interact with outsiders, found someone would listen their stories'. We did find a small part of locals, most of them are local makers, were driven by their hobby of making to get involved with the process and enjoyed the chance to develop their design ideas with outsiders, like the bamboo weaver with team A, the carpenters with team B and the elder ladies with team C. This suggests that in-situ making could encourage spontaneous participation as a form of 'performative knowledge-making' (cf. Sabiescu, et al. 2014) from some of locals who could share a similar 'point of view' in making with outside designers.

We also found that other people developed a pragmatic view about their involvement. As Meng disclosed, 'when we explained our purpose with the elder ladies' daughters-in-law who are younger, they quickly understood and said 'good, you could open a factory here after finished the prototype, and we could work for you''. The teams reported that without direct or potential economic benefits for local people they faced difficulties in getting participation, especially in the early design phase. As with Reitsma, Light and Rodgers (2014) the designers needed to develop an empathic understanding of local concerns in order to bring them into design activities. In team C's case, after Meng discovered the young ladies' interest in commercial opportunities, they conducted their evaluation with domestic tourists (the potential interest for locals), and then shared their findings with local participants to help motivate their participation.

However, although we strove to engage locals in the design process they ultimately contributed feedback and suggestions and did not become equal members of the design teams. Even local contributions such as fashioning bamboo tubes was more

of a production contribution rather than a design contribution. It shows even with the unique benefit of cultural exchange and ice-breaking, in-situ making faces the same challenge to facilitate true co-creation at the early design stage as other participatory approaches (cf. Hussain, Sanders and Steinert 2012).

During this study we broadened our scope for in-situ making. Initially we had considered in-situ to refer to making in the local makerspace, but as the study progressed we found that making, and showing the products of making, in other local locations encouraged participation from a broader range of local people. As Lucia concluded, ‘in-situ making does not mean just staying in a rural makerspace, but making and interacting dynamically in different occasions and locations with social interplay’. The advantage of focusing on tangible, portable, interactive design products is that they can easily be taken into various local environments such as fields, community spaces, and the street, and provide opportunities for serendipitous interaction design evaluation as discussed by Blom, Chipchase and Lehtikainen (2005) in contrast to creating a public exhibition (e.g. Reitsma, Light and Rodgers 2014; Wang et al., 2016) or undertaking studio based design work.

Finally, it should be noted that our design process lasted 10 days which is significantly less than many approaches to cross-cultural design such as Reitsma, Light and Rodgers (2014) whose process lasted 9 weeks and Brereton et al. (2012) in a longer period. From our point of view, the use of portable and interactive tangible prototypes allows a rapid immersion in local context through direct and hands on manipulation of interaction designs. It shows that adding direct manipulation to tangible interface design approaches of Reitsma, Light and Rodgers (2014) provides a rapid way to viscerally engage people in cross-cultural design. In this way the approach serves as an ice-



breaking approach which can build empathy and understanding of making possibilities, and could be used to rapidly stimulate further, more in-depth, cross-cultural design.

#### **4. Conclusion**

Cultures always have been the products of migration, exchange, and cross-fertilization (Fiss 2009). Our in-situ making and evaluation approach shows promise as both a quick path for designers to immerse themselves in local culture and traditions, and also as a catalyst for interacting with local people through design work conducted in a local context. It provides inspiration for design exploration in the early stage of design between designers and local participants. We found that the limited time and practical constraints of in-situ making meant that this short term is more suited to cultural product design than cross-cultural design. For true cross-cultural design to be possible more time and greater engagement with the local population is needed. Furthermore, the greatest benefit of our approach is for the designers learning about local culture and how to undertake digital making in-situ; the value generated and retained for the local population is limited in this early stage of a design process, for example, some benefit was gained by local recognition of the value of their culture and traditions in a digital form. Taking this as a starting point, future research could investigate how the effects of culture exchange could impact local cultural evolution in their transition in the face of increasing digital technologies and the influx of modern culture to the region.

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