Information and Communication Technologies as a Bridge between Global Designers and Local Users

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Abstract. This research uses an international design competition to evaluate the effectiveness of Information and Communication Technologies (ICTs) in trans-disciplinary design. Specifically, it focuses on transcending cultural gaps between professional designers and the local community of users. While clearly ICT has been influencing global processes in the design profession, it is unclear whether current ICTs can bridge the gap between professional and non-professional stakeholders within a design project that crosses large cultural differences and geographical distance. Through an international design competition with a Native American Nation in Northern California, the design processes of distant designers who had an ICT-mediated experience and local designers who had an additional in-person experience are compared and the familiarity of the architect with the place is evaluated before and after being exposed to ICT. Through this case study it was found that in settings with wide cultural gaps between designers and local-users a place-specific set of ICTs, representing the local community of users and their conceptions, can transcend disciplinary and cultural gaps. The importance of transdisciplinary design processes, that include local, non-professional experts, is emphasized.

Keywords: Design methods, co-design, social factors in design, community-based design, community-based research, ICT, ICT4D, design competition

1 Background

1.1 Introduction

This case study is a community-based research experiment that evaluates the use of Information and Communication Technologies (ICTs) as supporting tools for trans-disciplinary design with a focus on transcending the wide cultural and geographical gaps between multidisciplinary design professional and the local community of users and clients as nonprofessional disciplinary experts of the place. The research measures whether ICTs, communicating information about the place, allow architects

who cannot access the place, similar opportunities to produce place-appropriate design as those who were able to visit the place and meet with the users face-to-face. Place-appropriate design is evaluated by both professional designers and representatives of the local expert users through the design results.

Stemming from the building industry and environmental-design or place-making, the research relies on Canter's definition of place as the overlap between physical attributes, activities, and conceptions (Canter 1977). To learn conceptions of place – the subjective understandings of local users – interaction between designers and local users should occur. Therefore, using Blessing's design model inclusive of strategies, stages and activities (Blessing 1995), transdisciplinary design, as a *strategy* for place-appropriate results, includes local users working together with the professional designers throughout the design *stages* and across the variety of design *activities*.

While the information superhighway and general globalization processes reduce cultural differences between places and people, they also allow more designers to design in places that are geographically and culturally distant from their home base. As a consequence, small and rural communities are no longer restricted by the limited number of professional designers they can find in their area. Therefore, the challenge of understanding local characteristics and communicating these within teams of professionals and nonprofessionals at a distance is critical. As such, transdisciplinary design has the power to balance global forces with unique, local attributes and needs.

This research evaluates an international design competition, organized by CARES[1] and the Pinoleville Pomo Nation (PPN), a small Native American (NA) Nation located in Mendocino County in Northern California in the U.S. The conceptual design competition – ParticiPlace2012[2] – was open to practicing designers and students from all over the world. Designers were challenged to propose a conceptual design for a Living Culture Center for the PPN. This building was envisioned as both a community center to practice traditional and contemporary culture as well as a space to preserve and display the living culture of the tribe. The design brief for the competition was composed by a team of tribal citizens, architects, and engineers over a series of workshops and meetings. Nevertheless, due to geographical distance, some designers had limited direct interaction with the tribe and those who could not attend the site visit had to rely solely on ICT-mediated experiences to learn about the place and the users.

1.2   Top-down and bottom-up approaches for bridging cultural gaps with US Native American Nation

Emphasis on the user experience in the environmental design literature is strongly represented by the social design movement in architecture. Ethnographic methods, such as observations and interviews are often used in different design fields such as engineering, industrial design, and architecture. Yet many of them leave the user passive. More active methods – such as design charrettes, a collaboration method com-

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[1] CARES: Community Assessment of Renewable Energy and Sustainability. For more details about CARES, see planetcares.org

[2] For more information 2012.participlace.org

mon in the architectural realm, or co-creation developed in engineering – are often time-consuming and their long-term financial benefits are hard to justify. To encourage architects to add local users into the transdisciplinary design process, a strategy combining both political and academic approaches is required. In the political realm changes are required in building policies to empower local communities of users and to provide them with freedom to make their own design decisions at the local level. In 1996 the U.S. department of Housing and Urban Development (HUD) passed the NA Housing Assistance and Self-Determination Act (NAHASDA), which allows NA Nations to use federal funds to self-compose their housing solutions as opposed to being limited to pre-designed HUD houses[3]. This top-down change was the starting point of our co-design project with the Pinoleville Pomo Nation (PPN), which opened up the opportunity to identify the tools to support transdisciplinary design with emphasis on local experts and users. Technology by itself, we acknowledge, may not be enough for transdisciplinary design that includes local users. Design that allows local users to control decisions and project budgets, on the other hand, has the potential to become transdisciplinary in a way that can be facilitated with effective technology. The PPN's search for ways to use federal funds to create housing that supports their unique culture and desire for self-sustainability led them to CARES at UC Berkeley.

Due to their unique culture and lifestyle within U.S. society, the PPN is part of a place that is unfamiliar to many designers, both within and outside the U.S.. Being experts in their unique place, yet with no professional design expertise, PPN representatives constitute a range of disciplines concerning their cultural norms, local environment and user needs, therefore making them a comprehensive part of transdisciplinary design. Technology to support this type of transdisciplinary design has to transcend geographical, cultural and disciplinary gaps. In-addition, the very limited natural and financial resources of the PPN and the lack of professional services within their own culture, required us to focus this investigation on the extreme condition of a marginalized place with the underlying assumption that technology that can transcend these gaps will likely to be effective in narrower gaps as well. These extreme design conditions and gaps often result in a top-down approach overlooking different place-specific elements, resulting in culturally-inappropriate designs as in the examples provided by Rapoport (1990). Technology to bridge the designer – with his foreign, professional, top-down approach – and the community – located at the place, looking bottom-up – should support communication and sharing of information.

1.3   Literature review – technology to support comprehending conceptions

Most literature investigating the use of ICT for involving nonprofessionals in the design process focus on communicating physical-attributes of place, particularly the designed place. These are often missing Canter's activities and conceptions (Canter

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[3] The two programs authorized for Indian tribes under NAHASDA are the Indian Housing Block Grant (IHBG), which is a formula-based grant program, and Title VI Loan Guarantee, which provides financing guarantees to Indian tribes for private market loans to develop affordable housing. Regulations are published at 24 CFR Part 1000 (HUD 2012).

1977) for a complete place representation. Both these additional elements are directly connected to the user experience and transdisciplinary design that involves local expert users, in the early design stages, provides a good strategy for the designer to comprehend these richer aspects of place. The inclusion of local, nonprofessional people in collecting and representing place-related-data is already found in the field of Participatory GIS (Van Wart et al. 2010, Dunn 2007, Abbot et al. 1998).

Three-dimensional digital environments have been found effective in research looking into way-finding (Bhatt et al. 2011) and have been extensively used in the fields of architectural and urban history (Michon an El Antably 2013, El Antably 2010, AlSayyad 1999, AlSayyad et al. 1996). In recent years, the development of multiusers virtual environments (MUVEs) has allowed limited representation of people through embodiment (Chen and Kalay 2008) as part of place and has been tested and proven effective in journalism (Kalay and Grabowicz 2006) and historic preservation (Michon et al. 2008). MUVEs rely on gaming technology and producing a place-specific MUVE is time consuming and requires some professional skill. Online MUVEs, such as Second life, have been effectively used in design education (Hong et al. 2013) mostly for virtual environments and not as a representation of an existing environment.

Based on these experiences we developed the ParticiPlace methodology, which includes the media of images and videos that can easily be created by and with non-professional local experts to represent conceptions. The users are thus able to express the place using these representations as cultural probes.

Cultural probes, as developed by Gaver, Dunne and Pacenti (1999), are tools, such as postcards and cameras, to gather subjective information from users as inspirational material to familiarize the designer with groups of users. Originally developed for art and architectural design and inspired by Situationist International, the concept has recently been adapted by designers of Human Computer Interaction (HCI) as an alternative option for knowledge production (Boehner et al. 2007). Dealing with subjective information on the user's side and inspiration on the designer's side make these tools hard to evaluate (Gaver et al. 2004). Our case study uses digital cultural probes as representations of conceptions of place. The competition setting allows us to include an empirical evaluation of the method, using a few probes created with a community of users, to inspire a variety of designers working on the same project. We then evaluate the subjective and objective influences of the probes on the design process and compare the responses of those who were able to include a face-to-place interaction to those restricted to the digital probes.

2 Approach

2.1 Design Competition as a Design Experiment

This research uses ParticiPlace, a community-based, international design competition, as the main platform to explore the effectiveness of ICT in producing place-appropriate design. Other examples of research using design competitions include

Wooten and Ulrich (2013), focusing on innovation, and Valkenburg and Dorst (1998), focusing on collaboration within design teams.

Design competitions present a real life design scenario in which different designers work on the same project at the same time and thus can be defined as in vivo experiments. Advantages of using a community-based, international design competition as a research platform include:

- Real life conditions, with prizes and reputation at stake, encourage designers to produce the best designs they can.
- Competitions are a common scenario in global architectural practice, in general, and in developing regions, in particular. Many international competitions are used in developing regions to elicit a variety of contemporary international design ideas.
- They provide access to actual users/clients in relation to an actual project and designers, crucial components for evaluating ICT to support transdisciplinary design.
- Some evaluation of the designs is already embedded in the competition process.

Alternative research methods such as design experiments (e.g., Al-Sayed et al. 2010) would be restricted to design in the "lab" and would therefore use a much smaller time frame. Experiments based on design studio-classes (e.g., Bakergem in McCullough, Mitchell and Purcell 1990) often have longer timeframes yet are restricted to design students and would rarely include users or clients, an important component of conceptions. Shah et al. (2003) offer a design research method to overcome the science-engineering dichotomy and align engineering, experimental research methods with general and simplified lab experiments used in the sciences. They suggest decomposing each design method tested into key-components. The overall effectiveness of a method can then be predicted by experimentally studying the effectiveness of its components and its mutual interactions. Although such approaches can be used in constrained applications, real life transdisciplinary design has characteristics of complex systems with complex interconnections between its components, thus ICT successful in an in vitro experiment may fail in vivo. Therefore a methodology to evaluate the overall design strategy in "living" design conditions is needed.

Research focused on real-life conditions and looking at practiced design methods in industry often uses qualitative methods such as "building stories" as an investigation method (Martin, Heylighen and Cavallin 2005). The narrative technique allows capturing aspects of practice in different levels (overall project, team level and individual). With the goal to retain the realistic context of design, the research relies on the competition as a case-study which includes a small sample of participants but multiple sources of evidence, both qualitative and quantitative. These evidences capture both the nomothetic general properties influencing the design process (through questionnaires and blind evaluations) as well as the idiographic, specific characteristics recognized by individual designers (through questionnaires and interviews).

2.2   The Competition Process.

The competition announcement was sent to architecture schools around the globe, to international architecture and architectural-competition journals and websites, as well as to a variety of architecture firms in California and elsewhere. In addition, the call for proposal was spread through personal contacts. Transdisciplinary teams were encouraged by including, in the competition brief, challenges pertaining to a variety of disciplines, by providing separate prizes for sustainable engineering innovation and social and cultural integrity, and by including a multidisciplinary team of experts in the jury.

Thirty-eight groups registered to the competition, of which 17 submitted a design: seven from California, three from other U.S. states, and the rest from outside the U.S. The jury was comprised of three practitioners in architecture, engineering and environmental science and two PPN representatives. The jury members evaluated submissions through evaluation forms tailored for this competition, which were aggregated to calculate the winners.

Communication with registered participants of the competition was managed through a Google group and participants were encouraged to send questions throughout the process. The 17 design submissions represented 56 individual designers, of which 12 representatives from six groups were able to attend the site visit. The vast majority of the designers were architects; a few had previous professional experience in other disciplines: one team had a landscape architect, another included an engineer.

2.3   The Treatment: Technology provided to support transdisciplinary design

To support transdisciplinary design with a focus on the local expert users, a separate process was conducted with the local community of users to communicate conceptions of place. The goal was to engage the community in different ways that would support communication of their conceptions of place. We introduced a variety of available technologies – such as photo editing, video editing, blog writing, and social networks – through a workshop we conducted with about 15 PPN representatives – young children, youths, and adults. We created videos of PPN leaders walking the land and presenting the important qualities. The PPN representatives described the problems of performing cultural activities in current available spaces. In addition, the PPN representatives created a video in which they presented a variety of cultural aspects relevant to the living culture center. These videos, as well as several sets of photos of cultural activities, were made available for participants during the design process. They were posted on Youtube and Flickr and were open to comments. Additionally, a dedicated Facebook page and Twitter account were set up for the competition and made available for competitors and local PPN citizens to join and follow. The photos and videos were posted through these social media as well. Designers were asked to evaluate their familiarity with each element of the place and attribute the basis for this familiarity, both before the use of these additional technologies and after using (or not using) them for one month. In addition local representatives of users evaluated the submitted designs and their appropriateness to the place.

2.4 Data Collected

Throughout the competition the following methods were used to collect data:

- Initial registration form (37 teams out of which 17 submitted designs).
- First questionnaire: Self-evaluation of familiarity with the place and its sources *before* additional media (11 respondents out of 37 teams – 30% response rate).
- Second questionnaire: Self-evaluation of familiarity with the place and its sources *after* additional media (13 respondents – 35% response rate, of which 8 also answered the first questionnaire. 7 teams responded from the 17 who submitted designs – 41% response rate).
- Communication through Google groups (13 questions).
- Interviews with participants (6).
- Interview with Jury (2).
- Online hits and posts on Flickr, YouTube and Facebook.
- 17x5 Jury evaluations for each submitted design (5 jury members – 2 non-professional, local experts and 3 non-local design professionals) included 17 questions pertaining to the design requirements and its appropriateness to each element of the place.

3 Findings

3.1 Who Are the Participants and What Do They Know About the Place and the Users?

None of the participants had been to the PPN's reservation before the competition. Yet, 56% had been on other NA reservations. Other participants came into the competition with very little experience of the place and its people: 18% had never been to California, nor had met NA people of California.

Participants were asked to rate their familiarity with different elements of the place on a scale of 1 to 7 (very low familiarity to very high familiarity). Then they were asked to assess their place familiarity by selecting from a list of options that will be discussed in the following section. The subjective feeling of initial familiarity with the place is presented in Fig. 1, in comparison to the objective experiences of the designers (been or never been to a NA reservation in California). As can be expected, those who had never been to a NA reservation in California graded their familiarity lower than those who had. It is interesting to see that the difference between those who had the experience and those who didn't was greater in the "familiarity with people" than in the "familiarity with physical properties" of the place or the activities. Moreover, designers who had been to a NA reservation in California (mostly people who lived in California) felt that they knew the people more than the activities; yet, those who hadn't visited (or lived in California) felt that they knew the activities better than the people. Those who have been to a NA reservation felt their familiarity with activities was their weakest point. This shows the difficulties designers face in learning about the people for whom they are designing and learning their conceptions of place when there are large cultural gaps.
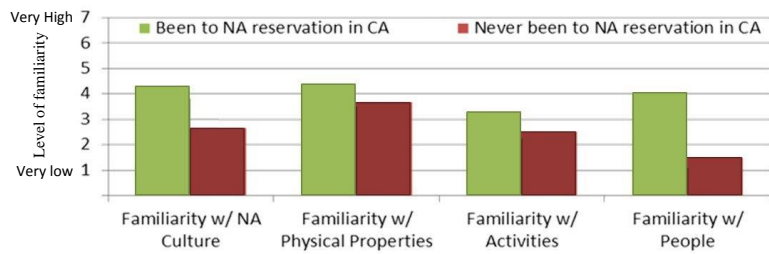
Fig. 1. Designer's self-evaluations of level familiarity with different elements of the place

3.2 What Did the Participants Ask About the Place?

The design brief for the competition included information about the physical attributes (such as maps and weather information), activities (such as a bubble diagram of the required activities), and conceptions (such as a short history of the land as told by the PPN representative, moods and characters identified by PPN citizens for each required space). In addition, the design guidelines as chosen by the PPN representatives were the Fully Integrated Thinking ™ (FIT) framework developed by the Biomimicry 3.8 and HOK, which includes 15 lenses touching all three elements of place. Beyond the information provided, a total of seven e-mails with 13 questions were sent from six different participants and 33 questions were posted through the registration form. Sixty-five percent of the questions related to physical attributes such as asking for site photos, additional climate data, geologic data etc. Nine percent related to activities and included requests for images of actual tribal members, their representations of place, as well as asking for more details about square footage of the different space/activities defined in the program. Finally, 11% related to conceptions and asked about cultural beliefs, or tribal stories associated with a link one of the participants found online. The rest were related to submission instructions and not to the place.

Based on discussions with participants, after the competition ended, the design guidelines were very detailed for the activities, which may explain the low number of questions asked in this realm. By providing characteristics and moods of each space, the design brief provided more information about the conceptions of place than most design projects, and only a few architects required more details about this element.

3.3 Media

A comparison of the self-reported evaluation of familiarity with the place by designers who didn't visit the site, before and after being introduced to the added media (one month apart), provides some insight into ICT's influence. On average the reported familiarity with the physical attributes grew by 7.14%, activities grew by 14.3% and conceptions grew by 8.6%. After submitting their designs, participants were asked to evaluate each media used on a scale from 0 (not effectual) to 4 (extremely effectual), as presented in Fig. 2. According to the designers who had an additional non-mediated interaction this experience was the most influential on the design (some influence was found when another team member visited the site within the design

team). In general, most media were more influential for those who only had the ICT-mediated experience. This emphasizes the perceived importance of such alternative sources of information by designers who have no access to in-person experiences. Books, movies (non-online) and weather data were still found to be more important to those with direct experience. This may imply that these media are more accessible to local designers and that non-local designers may have language barriers or difficulties identifying or accessing relevant information through this media. Moreover, it shows that those with limited direct access to place and people relied mostly on provided online sources.
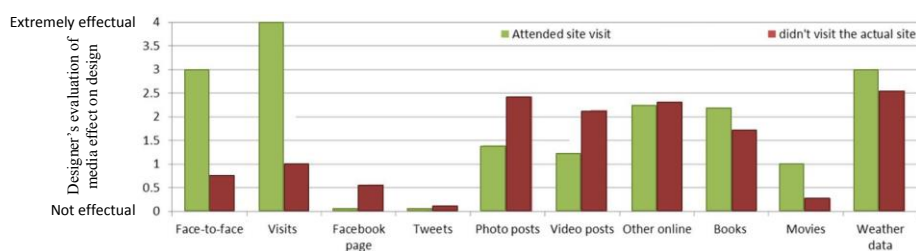

Fig. 2. Effect of different information types on the design based on designer's experience

3.4 "Meeting the Place" – a Transdisciplinary Evaluation of Design

As part of the evaluation of place, Canter suggests considering the evaluations that people make. Hence, the evaluation of the submitted designs included a transdisciplinary jury of professional (architects, engineers and biologist-designer), as well as local, representatives of the PPN. The form provided to the jury included grading a list of 17 criteria, taken from the design brief, including specific questions about the appropriateness of the design to the PPN. Subjectively, ICT successfully contributed to the familiarity with the place of those who couldn't visit the site. Additionally teams who visited the place, performed, on average, as well as those who relied solely on ICT-mediated experiences. The variations in the evaluations between the PPN representatives were high, ranging from a standard deviation of 0 (consensus) to 40 while the standard deviation of the professional team ranges from 2 to 21. The PPN jury members also had a higher standard deviation within their own evaluation compared to the professional jury members. This calls for a larger jury or evaluators, particularly from the nonprofessional members.

Besides the 14 questions in the jury's evaluation forms focusing on different qualities of the design corresponding to each of the FIT lenses and the design brief, three additional questions asked the jury to evaluate, on a 1-7 scale, the "appropriateness of the design to the physical properties of the place", "to the activities" and "to the people". Theses evaluations were compared to the self-evaluation that designers provided. Very weak correlation was found between designers' perception of familiarity with the place and the jury's average evaluation. Nevertheless, when separating the jury into the professional jury and the local experts, a different picture appears (Fig. 3): While the local experts had little correlation with the designer's self-evaluations,

the professional jury is very closely correlated to the self-evaluation of the designers. This provides evidence of the disconnect between the professional designers and the local experts, as well as the connection between the competing designers and the professional designers in the jury: When a participant felt familiar with the place, whether based on direct or IT-mediated interaction, they also managed to convince the professional multi-disciplinary jury that they were familiar with the place, but not necessarily the local, non-professional, community experts.
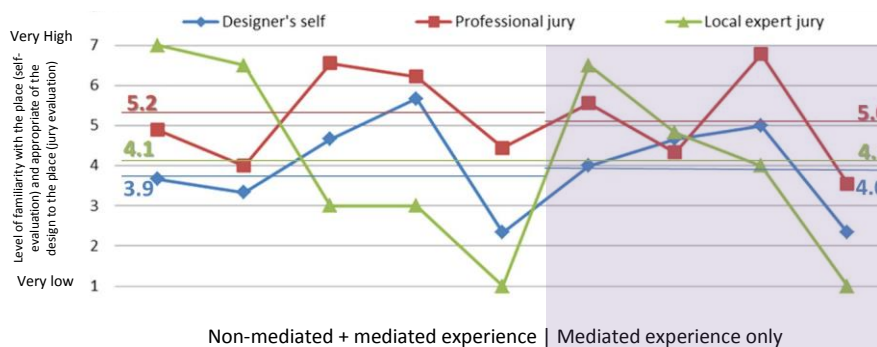

Fig. 3. "Meeting" the place- comparing evaluations of professional jury, nonprofessional jury, and designers

4 Conclusions

This research relies on an environmental design understanding that includes conceptions – local-user's subjective understanding of place – as one of the elements of place (Canter 1977). Conceptions would be hard to communicate without some involvement of the local users. Therefore understanding conceptions as part of place-appropriate design calls for a transdisciplinary design process that brings together designers and local expert users.

The ParticiPlace paradigm used in this case study includes information technologies, such as digital photos and videos produced by or with the community and communicated through different web-based social media such as Facebook, YouTube, and Flickr. This set of technologies aims to reflect the conceptions of the local community of users regarding the (current) place and the project (future place).

The research shows that ICT helped bridge the gap between non-local designers and place. Nevertheless, based on objective usage data and subjective reports provided by the designers through questionnaires and interviews, not all media were effective for the design. Facebook, as a social network, proved to have only a slight influence on the design. Most designers claimed that they were not regular users of Facebook or other social networks. The local community had concerns relating to privacy that limited their choice to communicate through this medium as well. Measuring subjective evaluations of familiarity with the place during the transdisciplinary design shows that familiarity grew over time. Designers who were initially least familiar with the place, pointed to videos and photos as the basis for this increased familiarity. For

those who visited the site and had face-to-face interaction with the people, other sources, such as books and online websites, were found more effectual than photos and videos of the site and the people. This highlights that local designers not only have an information advantage through direct access to the place, they also have an indirect advantage by being able to locate other relevant sources of information online and offline. Therefore, communicating local conceptions through online information is a crucial step for non-local designers to get familiar with the place

In-person experiences, such as visiting the site and meeting with local users, are important features of transdisciplinary design. Yet, in conditions of wide geographical and cultural gaps, the ParticiPlace paradigm, in which local users use ICT to represent their place and their conceptions, can help overcome the gaps and allow both local and non-local designers to become familiar with the place. This paradigm is project- and place-specific and its time-efficiency compared to face-to-face interactions was not evaluated as part of this research. It would therefore be wrong to assume that ICT should replace in-person interaction in transdisciplinary design.

An interesting correlation was found between designers' self-evaluation of knowing the place and the final-design evaluation of the professional jury while only a weak correlation was found with the final-design evaluation of the nonprofessional, local expert jury. Future research should focus on transcending place conceptions between professionals and non-professionals.

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