
Participatory Shelter Design for Displaced Populace: Reflections from a User Study

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Abstract

The world is facing a forced displacement crisis that is only expected to worsen as resources become scarcer and war, climate change, and economic decline pervade. Design and technology have not traditionally played an active role in the crisis mitigation. But the ICTD community is increasingly gaining awareness and seeking interventions to displacement-related challenges, including those faced by refugees living in camps. In this work, we propose a new application domain for HCI4D in refugee camps, namely shelter design, identified through recent fieldwork in camps in North Iraq. We then present a sketch-based paper interface as a potential shelter design solution, and reflect upon the process of evaluating it with a group of recent refugees in Canada.

Author Keywords

Participatory design; 2D sketching; paper-based interfaces; user study; refugee empowerment; HCI4D.

ACM Classification Keywords

H.5.2. [Information interfaces and presentation]: User Interfaces – user-centered-design.

Introduction

In most mass displacement contexts such as refugee camps, food, medical care, education, employment,

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Figure 1: Gradual transition from tents and makeshift homes to concrete through occupant-built shelters in North Iraqi camps

and shelter often remain inadequate for as long as the displacement situation persists. That could be months, but more often years given that two thirds of refugees live in camps for more than five years [1].

Shelter in most refugee camps means canvas tents, tarp, caravans, or matting supplied by the UN High Commissioner for Refugees (UNHCR). Over time, the negligible privacy, safety, sanitation, and thermal comfort afforded by such temporary provisions produce appalling living conditions. Seeking to improve their situations, refugees respond by tweaking and augmenting their squalid shelters with any available resources, triggering the chaotic, hazardous, and unstructured evolution of camp realms.

Despite its prevalence, the issue of inadequate shelter in refugee camps is largely overlooked by both architects and the ICTD community. But it is of chief interest to the primary author due to her training in architecture and personal experience with war. As such, we sought to investigate the shelter situation in camps first-hand, direct the attention of the ICTD community to it, and start developing and evaluating a solution. We will first elucidate the motivation behind this work given its newness to the ICTD community. Then we will present a sketch-based design intervention, its preliminary interface evaluation, and a summary of lessons learned from working with refugee participants.

Motivation and Field Observations

In October 2016, the primary author visited two Syrian refugee camps (Darashakran and Kawergosk) and four Internally Displaced Person (IDP) camps in North Iraq (Baharka and Debaga 1 to 4). The camps are 4 to 2 years old. She found that NGOs such as the Danish

Refugee Council (DRC) are steadily building sewage systems, roads, and private kitchens and washrooms (for each family) in collaboration with the government. Furthermore, temporary shelters are vanishing into concrete structures that transpire by their future occupants without architects, engineers, or construction professionals (Figure 1). This transformation in the built environment from temporary to permanent in North Iraqi camps can be further articulated in 10 points:

1. The government of North Iraq is steadily granting refugees and IDPs permission to build permanent shelters in camps, sometimes as early as 9 months after moving into the camp.
2. Refugees and IDPs design and build their own homes, even though the majority have no construction experience. They learn through imitation, knowledge sharing, and community collaborations. In rare cases, construction workers from or outside the camp are hired.
3. Refugees and IDPs finance construction through savings, selling valuables or property back home, and/or precarious jobs in and around camps.
4. Concrete blocks and cement, the local building standard, are the sole construction medium.
5. The construction process is often incremental, moving one concrete block at a time due to money constraints and fluctuating restrictions on material entry to camps.
6. The design and construction is iterative, with refugees and IDPs sometimes *demolishing* what they built due to design or spatial arrangement errors.
7. The DRC builds standardized 1-room concrete block shelters for those in dire need. But occupants sometimes end up demolishing the DRC shelter and using its concrete to build a more customized shelter.

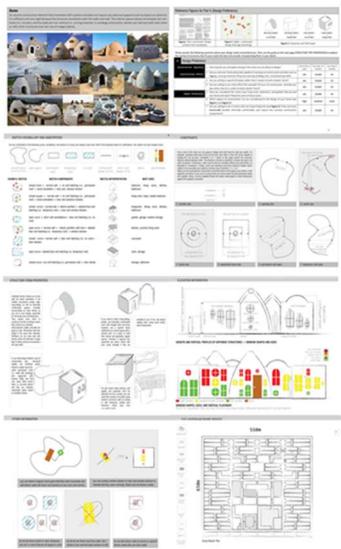


Figure 2: Selected pages from the paper interface (toolkit)

8. The DRC shelters have proper foundations and roofs and can support future expansion, while the refugee and IDP shelters do not due to cost and/or knowledge gap.
9. Refugees and IDPs get *relatively* decent plot sizes (70-90 m² for a family of 4-5)
10. Refugees and IDPs sign agreements that they own the shelter but the land remains the government's property. Furthermore, they can be evacuated at any time.

Such observations (allowing permanent construction before the 5-year mark, refugees financing construction, building without prior experience, iterative design, etc.) are rather surprising, progressive, and encouraging for camps. We cannot claim that they apply to refugee camps in general though, because the unique political situation in North Iraq might have been the primary propeller behind permitting proper shelter construction. For example, the Syrian refugees are predominantly Kurdish, and North Iraq is governed by a Kurdish party seeking an independent state. Nonetheless, shelter dynamics in North Iraqi camps might become the norm in future camps (politics permitting). And so will be the need to build one's own home regardless of experience (since anyone is prone to becoming a refugee or IDP). As such, we see the need to empower refugees and IDPs in camps to design their future homes within a given set of constraints and build them despite the lack of prior construction experience. Such solution is related in principle to two areas that are currently popular in ICT discourse: participatory design and personal fabrication.

Proposed Solution

At the core of our envisioned solution is a design interface (toolkit) that enables users to design their

future homes by sketching and annotatively expressing space and fenestration requirements. The toolkit is deliberately "no-tech", relying on paper, both for capturing the user design ideas, and for delivering the corresponding construction manuals. The toolkit incorporates architectural know-how in the form of design vocabulary, annotations, stencils, and pre-designed templates to eliminate the need for intervention by professional architects in the initial design process. Once drawn, the user designs are scanned and transmitted to a backend platform, which uses algorithms and/or manual work by a cloud network of volunteer architects and interior designers, to adjust the designs to fit structural requirements and camp restrictions. The platform then produces 3D renderings, and generates detailed step by step construction instructions to assemble the structure using an appropriate local building technique, along with the required materials list and projected costs. Upon delivery to the camp, the construction instruction kits and material requirements are provided to families so that they can start purchasing and building their future domiciles from foundation to the roof.

After multiple iterations and intermediate user studies, we have designed and refined the first component of the envisioned solution, namely the paper-based design interface (Figure 2). The next section presents a user study with both designers and non-designers, some were refugee participants who have recently moved to Canada.

In-Lab Interface Evaluation

We performed a user study to explore how well our solution overcomes the limitations of a paper user interface, and to evaluate usability, participant



Figure 3: Study tools, tasks, user input, and optimization output

preferences, nature of sketches drawn, and whether the toolkit would simplify the design process enough so that there is no difference in performance (time, number of questions and errors) between participants with or without shelter design experience.

Participants

We recruited two groups of participants. The first group ("non-designers") were individuals who did not have any experience in designing or building shelters. The second group ("designers") were individuals with academic training and/or practical experience in housing design and construction, such as architects, interior designers, property developers, and builders. Both groups included a mix of refugees and non-refugees. Ideally, we would test the kit on site in refugee camps but we have yet to obtain the necessary permissions. As such, we recruited refugee participants from Toronto via word of mouth and newcomer agencies.

In total, we recruited 24 participants (12 designers; 12 non-designers), of whom 5 were refugees; 3 had lived in a camp within the past 4 years. Ages ranged from 9 to 50 (mean=28.6, SD=11.6). 17 participants were female and 7 were male. Half were immigrants or refugees who have lived in their new adoptive country for less than 3 years. Some of the participants were originally from rural areas but all now live in a large metropolitan area in Canada.

The five refugee participants have recently (< 1 year) moved from Jordan to Canada. One of them is an illiterate construction worker who lived in al Zaatari camp in Jordan and has five kids. The four other participants form two couples. One couple lived in al

Zaatari for a short period in tent adjacent to their in-law's tents in 2012 and had two very young daughters. The husband completed grade 9 and the wife grade 5. After al-Zaatari they rented a clay house in a rural area in Jordan where the husband took on construction jobs. Originally they lived in the extended family house in rural Syria. The other couple come from an urban area in Syria and lived in an apartment in Amman subsidized by the UNHCR. They both finished high school. The rest of the participants come from a mixture of ethnic backgrounds and income status.

Tasks and Procedures

After briefing participants on the research motivation and procedures and obtaining their informed consent, we delivered a 5-minute presentation on the magnitude of the forced displacement crisis today, living conditions in camps, and possible construction practices. We then asked participants to envision that they have been living in a camp in Iraq or Jordan for the past several months and that they were given our toolkit to design a shelter which they could eventually build. Finally, we went over the kit page by page and the associated tasks (Figure 3): filling out a survey about shelter preference, checking the permitted sketch annotations, understanding the design constraints, inspecting stencils and templates, sketching a shelter, and applying window and door stickers. There was no time limit and participants were encouraged to ask questions and give feedback throughout the study. We helped illiterate users with tasks requiring reading and writing.

Measures

The study had multiple variables (Table 1), observed and measured while participants carried out the study

(stage 1), from a post-study questionnaire (stage 2), and from analyzing the digitized sketched (stage 3).

Lessons Learned from Refugee Participants

Rather than going over the study results (which pertains to the performance of designers vs. non-designers, use of stencils, preferred geometric forms, etc.), we will report and reflect on the challenges, interesting observations, and questions that emerged from the study sessions with the refugee participants.

Task Performance and Rule Violations

The performance of the refugee participants in the study is best characterized by their genuine investment in the design but consistent violation of the interface usage rules. Unlike other participants, they never referred to the instructions package after the briefing and sought clarifications from us or each other, completely undermining the point of the instructive interface. Some of the violations (there were almost none by non-refugee participants) included not using the provided window or door stickers (just annotating their location by pencil), putting stickers within rooms rather than on walls as illustrated, leaving stencils without adhering or tracing them on paper, going beyond plot boundaries, and scribbling over template sheets instead of transferring them to the drawing sheet. They mostly dismissed our misuse remarks, and we had to “fix” their input after digitization (in order to retain the original sketch). This could be attributed to the way in which they regard and follow instructions. For example, they perceived the study as low stakes so breaking the rules did not have grave circumstances (especially that rule breaking is common in all life aspects in the Middle East). And due to their lack of engagement with scientific research, they did not

realize that having the researcher fix the sketches could jeopardize the study results. Interestingly, what they missed in precise execution they more than made up for when considering shelter size, practicality, livability, privacy, future expansions, and resource constraints. They involved their kids in the discussion and even considered how their design would fit extended family members should they need to stay together in camps. They were also very sensitive to shelter sizes (realizing that the kit’s hypothetical 120m² plots were too generous for a camp) and produced designs occupying half the plot (for a single family) or designated them as shared with extended family. Conversely, the non-refugee participants focused on meticulously following the kit directions, producing elaborate and compliant sketches but with less consideration for functionality and space occupation. The contrast between what the two groups perfected was interesting, signifying a challenge for HCI4D in terms of garnering both realistic engagement and precise execution.

Engagement in Visionary Research

During the briefing, we were surprised by the enthusiastic attitude of the non-refugee participants. Many were already aware of the global displacement crisis and chose to participate out of a genuine interest in finding a solution. The study results are irrelevant here, but 88% of the participants did recommend the deployment of our participatory/self-help shelter solution for displaced populace after the study. Refugees are “... losing everything and want to psychologically gain control over something and start [their] life” as one participant put it.

But our five refugee participants approached the experiment with trepidation. They said that design and

Variable Observed	Stage
Time required to use the tool	1
Level of engagement	1
Number of questions	1
Ease of use (1 to 5)	2
Would use the tool to build house	2
dome usage in area units (vs. linear structures)	3
flat roof usage in area units (vs. curving ceiling like domes)	3
stencil tracing in length units (vs. freehand drawing)	3
constraints broken in the sketch (e.g. exceeding maximum spans, usage errors)	3
design errors (e.g. unreachable voids in the structure)	3

Table 1: Study variables

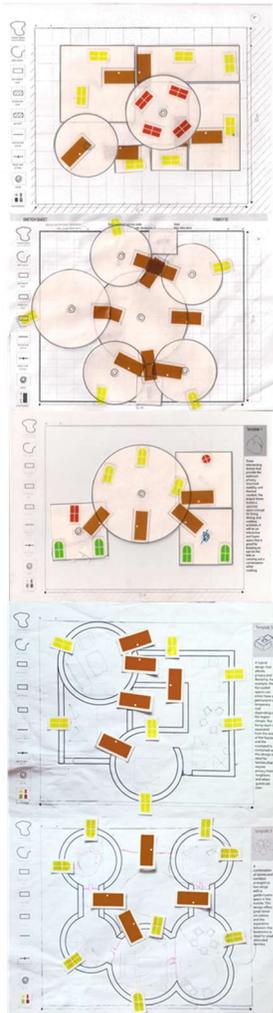


Figure 4: Refugee participant designs

sophisticated computations are frivolous, because what people need in camps is food, electricity, and readily available shelters. Which is true; why care about design and self-help goals if critical necessities such as food and medicine are lacking? Their attitude can be further justified by the fact that they did not spend more than months (if any) in camps and probably never considered building a shelter. Finally, as individuals who had and still have to worry about meeting day-to-day needs, they are not in the habit of considering visionary research goals.

With further conversations during the study, we discovered that the main need for electricity in camps was for shelter heating and cooling (rather than powering a TV for example). So we explained that a well-built, insulated, and properly oriented concrete or mud shelter will significantly improve thermal comfort in the absence of electricity. After yet more discussions, the refugee participants recalled deaths caused by tent fires (which burn to nothing in 28 seconds), austere winter nights, and the constant fear they experienced in fragile tents and caravans. Finally, they brought up (without our provocation) how they and their ancestors built their own homes in Syria, the care and appropriation that went into building one's home, and the unsuitability of North American apartments to their life style. Eventually they arrived at an agreement that there is a need to design and build one's own shelter and that could contribute greatly to improving lives in camps on the long term. In fact, two male refugees took ownership of the idea, advising us to build a shelter design and education tool for the UN to deploy.

Engaging participants in what we as researchers deem interesting, novel, or useful for the long term is

challenging. At the end, the study was successful given the quality and diversity of the produced sketches (Figure 4). But we had to deviate from the protocol and probe the most relevant participations. The study's 5-minute motivation briefing extended into an hour conversation with the refugee participants. And it was only after the refugee participants voluntarily shared details about their pre/in/post camp lives that they became engaged participants. Some reviewers have argued that we biased the participants about the interface need. But how can we make such long-term visions relevant to participants? Finally, we are inclined to believe that refugees (in camps and in North America) do not share yet the ICTD's community belief that design and ICT have a great potential to change lives for the better.

Empowerment in Knowledge Transfer

All of our refugee participants voluntarily shared a lot about their lives before the Syrian Civil war, the difficult escape journey, the suffering in diaspora, eventual arrival to Canada, and the adaptation and challenges they experience in their new home. Their stories have helped us greatly understand life, shelter, and technology dynamics in diaspora and informed our design considerations for the interface improvement. Furthermore, all refugee participants were vocal and insightful in providing feedback on the interface such as the including templates based on the country of origin of the target users, basing the grid size on the construction medium, making stencils dirt and water proof, considering other building material etc... Most importantly, the refugee participants felt extremely grateful for being able to share their knowledge to advance research and genuinely offered to introduce us to fellow refugees in Canada as they want others to

benefit from their difficult experience. We strongly felt that our study has empowered them (at least temporarily). That is because as new refugees in North America, their lives revolve around adapting, learning, acquiring “missing” skills, and filling the gaps as though the knowledge and experiences they bring are not worth sharing. Host communities and researchers are thus missing learning opportunity.

Past Reclamation

During one of the early study sessions, an experienced architect suggested our approach may help refugees “re-live their house in an indirect way”. This was confirmed multiple times, as refugee participants attempted to recreate the living accommodation they left behind before fleeing war to a camp. And they fondly told us about the homes they left while engaging with the toolkit. One in particular found a blank page and drew on its back the plan of the house he shared with his extended family before fleeing war to a camp. He then designed an adapted version using the paper interface stating that his new sketch is exactly the house he wants, be it in Canada or in a camp.

Affording refugees, be it in camps or sponsoring nations, the ability to reclaim some of their past and materialize it in their new homes is an opportunity for ICT practitioners. Such affordance we feel is the most important aspect of our vision and interface, and the scope of application is immense, via communication, personal fabrication, and knowledge capturing/sharing.

REBs Vulnerability Criteria

Our study was fairly innocuous, yet had to undergo a lengthy REB review as our participants were deemed vulnerable. For example, every time we want to start a

new refugee-related protocol or amend an existing one, we have to go through the full review process which takes over a month at our institute. This highly impedes the research progress and renders the process fragmented and restricting. As discussed earlier, the refugee participants were resilient and open to sharing and partaking in various tasks. Both male and female refugees (from our study and the ones we met during field work) were capable individuals who strived for better living conditions and had a lot to share and teach us. This contradicts the general conviction (supported by REBs) that displaced people are victims. We therefore recommend that REBs reconsider their vulnerability criteria when it comes to refugee participants, or introduce new ones that maintain the subjects’ safety but take into account the true meaning of vulnerability.

Conclusions

We have drawn a link between HCI and refugee empowerment, introduced a design tool for personalizing shelters in camps, and presented a user study with refugee participants from Canada. The study yielded some delightful designs. Participants’ enthusiasm and engagement was unexpected, especially as many (namely the refugee participants) were very skeptical at the outset. Equally, if not more importantly, was the refugee participants’ resiliency, knowledge, approach to tasks, and the desire to reclaim their pasts as they build their futures.

References

1. Nicholas Crawford, John Cosgrave, and Simone Haysom. 2015. *Report on Protracted Displacement September 2015*. Overseas Development Institute, London.