Shelter Dynamics in Refugee and IDP Camps: Customization, Permanency, and Opportunities

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ABSTRACT

The UNHCR estimates that the average forced displacement period is 17 years, which many refugees and IDPs (Internally Displaced Persons) spend entirely in camps. This reality has caused camps to be increasingly considered as permanent cities of our future rather than temporary relief solutions. Unfortunately, this recognition has not been matched by corresponding increases in the planning or resources devoted to camps. In the case of shelter, a basic human need, little to no architectural infrastructure exists and urban planning remains short-term. As a result, camp dwellers are often forced to take it upon themselves to transform existing humanitarian storage facilities into essential domiciles, markets, and communities. In this paper, we describe our observations and survey results on the state of and practices surrounding shelter from three camps in North Iraq. Our findings illustrate the various modes of shelter that exist due to economic and political expediency, and highlight opportunities for ICTs to improve the quality of life for millions of displaced residents.

KEYWORDS

Participatory design; refugees; empowerment; shelter.

1 INTRODUCTION

Surrounded by abundance in rich countries we tend to apply technology towards increasing efficiency, comfort, and entertainment. But in contexts of scarcity, even very limited access to information technology can make a difference to living standards. In this paper, we focus on life in camps for refugees and internally displaced people, where scarcity is extreme. Unfortunately, such camps are increasingly common in several regions of the world and house people displaced by war, famine, and extreme weather events. Today, there are over 60 million displaced persons around the globe,
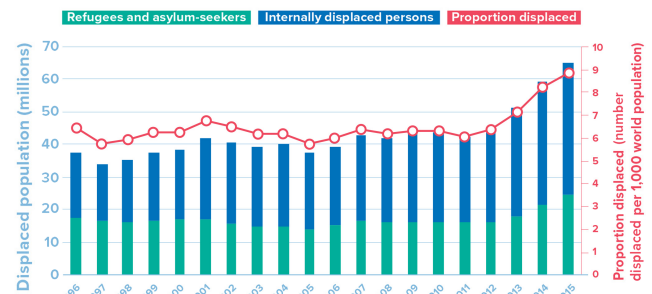
Figure 1: Global Forced displacement trends [40]

of which 12.4 million were newly displaced in 2015 [40]. Forced displacement is expected to get worse under climate change due to loss of access to fresh water, inundation by rising sea levels, and increased extreme weather events. Some estimates suggest globally as many as 200 million climate refugees by 2050 [5, 17].

In most mass displacement contexts, food, medical care, education, employment, and shelter are generally inadequate. Far from being temporary relief solutions, camps are increasingly permanent settlements. The UNHCR estimates that the average displacement period is 17 years, which many refugees and displaced people spend entirely in camps. Furthermore, two thirds of refugees live in camps for more than five years [21]. Unfortunately, camps are only intended for temporary relief and shelter in most camps consists of canvas tents, tarp, caravans, or matting supplied by the UN High Commissioner for Refugees (UNHCR) or local governments. Over time, the marginal privacy, safety, sanitation, and thermal comfort afforded by such temporary provisions can produce poor living conditions.

Despite the necessity of shelter and its pervasive inadequacy in camps, the shelter problem has largely been overlooked. In our previous work, we argued that architects, planners, and policy makers should play a greater role in camps [30], and explored the possibility of leveraging ideas from centuries-old vernacular architecture, where occupants having derived their design and construction practices from their own experiences and needs have greater agency over their shelters [31].

In this paper, we study the state of and practices surrounding shelter from three camps in north Iraq. We present our observations

from the camps, our survey results from 5,362 shelters, and conversations with 48 camp managers and NGO (non-governmental organization) staff. Our findings reveal how camp dwellers who, caught between the temporary conception of camps and their actual permanence, manage to forcibly change their living environments. Seeking to improve their situation with any available resources, occupants respond by tweaking and augmenting their inflicted habitats, triggering chaotic, hazardous, and unstructured evolution of camps. Our results challenge the exclusivity of construction to architects and suggest how people can empower themselves through design of their shelters.

2 BACKGROUND

Forced migration occurs when one or more causal factors impact an area, causing its population to flee their homes suddenly or unexpectedly in large numbers. If the displaced people cross an international border, then they are classified as refugees; otherwise, they are identified as IDPs.

The 2003 invasion of Iraq began as a short-term nation building endeavor. However, it exacerbated, creating over 2 million IDPs and another 2 million refugees. Since 2011, 4 million Syrian refugees have fled the civil war, with some seeking refuge in the relatively safer Iraq. Iraq was not only receiving large numbers of Syrian refugees, but also saw the return of many Iraqi refugees from Syria. Often these returnees could not go back to their places of origin, leading to secondary displacement inside Iraq [8]. Moreover, the ISIS turmoil since 2014 has trigged refugee and IDP waves within and back and forth between Syria and Iraq. Currently, Iraq hosts over 3 million IDPs [42] and a quarter of a million Syrian refugees. It is estimated that 39% of these refugees are dispersed across 10 refugee camps in the governates of Duhok, Suleimanyah, Erbil, and Anbar in north Iraq [43]. Iraq also has 59 formal IDP camps, hosting 10% of the total IDPs in the country [28]

Around 97% of Iraq is arid land, with a dry climate characterized by temperatures ranging from higher than 48-degree C (120 degrees Fahrenheit) in July and August to below freezing in January. High winds as well as sand and snow storms hit the northern regions yearly, which is the area we focus on in this paper [11]. These harsh conditions mean that the conventional emergency-focused shelter provisions in camps are often inadequate at protecting occupants from the extreme cold, heat, sand, and wind.

2.1 Data Challenges

Camps in north Iraq are fueled by both the ongoing Syrian Civil war and the ISIS hostilities in the north of the country. As such, camps host both refugees and IDPs, though they are largely kept homogeneous and the two groups rarely mingle. As is typical in war-charged forced displacement, the highly volatile political and security situation in both the source and destination countries lead to constantly morphing camps. The ongoing ISIS destruction causes influxes of new IDPs every week. At the same time, some IDPs are returning to villages recently freed from ISIS. At the time of writing, incoming IDP flows exceed outgoing flows, so new camps are being established and existing ones expanded. Sometimes the situation reverses. For example, prior to the beginning of battle in October 2016 camps were evacuated, contracted, and amalgamated accordingly.

Such plasticity makes it hard to reason about permanent shelters, secondary and tertiary in-camp healthcare, and long-term development programs, and is a classic predicament in displacement discourse.

The variability also renders even the most recent information sources obsolete, which impedes research, because it is hard to find accurate data snapshots especially from scholarly resources. The only scholarly data we found on IDP camps in Iraq comes from the Iraqi Research Foundation for Analysis and Development (IRFAD), but the data dates back to 2014 and is already outdated. Despite the overall dynamism though, the camps we visited; Darashakran for Syrian refugees (41 months old), Kawergosk for Syrian refugees (42 months old), Baharka for Iraqi IDPs (33 months old), and Debaga I for Iraqi IDPs (15 months old) are stable in size and are steadily evolving into small towns.

Inconsistent and missing data makes research on camps, especially IDP camps, more difficult. Furthermore, several different stakeholders operate in the camps and do not always coordinate or communicate. The Iraqi government (more accurately the Government of Kurdistan) oversees IDP camps and the UNHCR has presence, but does not maintain the rigorous documentation and data reports it does in refugee camps. Hence, for Darashakran and Kawergosk camps, general statistics, demographics, funding, services, livelihood assessments, and infrastructure reports are readily available on the UNHCR website. Finding data on IDP camps often depends on whether an NGO has commissioned a survey. The fact sheets on Baharka and Debaga camps for example are compiled by REACH, an initiative between organizations and the United Nations Operational Satellite Applications Programme (UNOSAT) that develops information products to enhance planning and decision-making in the humanitarian efforts. Reports on other IDP camps in the region, especially newer ones such as Khazir, are not available.

3 RELATED WORK

When it comes to shelters, self-help and customization can be traced to pre-historic times and is most famously captured in Rudofsky's seminal 1964 book, "Architecture without Architects." In more recent times, affording occupants agency over their shelter design and construction with or without professional interventions was advocated for by architects [6, 12] and the UN [25], and exemplified in the works of Architecture for Humanity [15, 16], Rural Studio [24], and Elemental [4] among others. More specific to camp contexts, Thomson [34] illustrates how Congolese residing in refugee camps in Tanzania build homes with sundried mud brick and thatched roofs; a government-imposed construction technique that yields temporary domiciles with traceless demolition. The Guardian reports on the now-closed Calais camp in France and the various structures occupants erected proclaiming their unique cultural heritages [44]. Habib et. al's investigation of living conditions in Palestinian refugee camps in Lebanon reveals temporary and permanent haphazard customization to standard camp shelters that transpire over the decades to accommodate family growth within austere expansion boundaries [19]. Sabie and Sabie trace such interventions to about 6 years after camps' establishment [29]. Similar dynamics have been documented in the 5-year old Zaatari camp for Syrian refugees in Jordan [23, 37]. Our work is positioned in this space, but

focuses on a new context (refugee and IDP camps in north Iraq) and their specific construction approach. We seek to formally quantify and qualify the extent of shelter permanency and customization in camps.

In terms of ICT presence in camps, very few researchers have studied technology propagation and interventions opportunities there. The most relevant work is the survey of 234 refugees that Maitland et al. conducted in Zaatari [46] which reveals a high level of mobile phone penetration (89%). Other researchers studied computer labs in Palestinian refugee camps [1–3], as well as fabrication [32], and report on infrastructural, logistical, and social challenges. Recent work in the Zaatari camp engaged residents in participatory design exercises [13, 33, 47], to discover that refugees are innovative and continuously seek to improve their conditions. Except for our past work [30], shelter design however remains a largely underexplored topic in HCI4D and ICT4D as evidenced by recent literature reviews [9, 18, 26]. Furthermore, given access and infrastructure barriers, our vision is to understand and promote human-driven ICT-supported self-help shelter design and construction in camps.

4 METHODS

In October 2016, the first author visited two Syrian refugee camps (Darashakran and Kawergosk) and two Internally Displaced Person (IDP) camps in North Iraq (Baharka and Debaga 1). The camp choice was motivated by access to contacts, absence of data on such camps in the literature befitting camp age (1 to 3.5 years old), presence of both refugee and IDPs, and the unique shelter dynamics on the ground. In terms of age, these camps are not too new, so they are ideal for analyzing shelter permanency and customization. New camps are usually in an active emergency phase, and occupants may not be even assigned tents, let alone had the chance to customize or consider more permanent construction. The aforementioned camps are located outside Erbil; the capital of the Kurdistan Regional Government in Iraq.

The field work extended over 10 days, during which staff from a local NGO (anonymized for security reasons) took the first author with them on their full-day camp rotations. In camps, NGOs hire refugees and IDPs to do most of the legwork since they live in the camp and know its residents and geography the best. They are referred to as volunteers, but are paid through cash-for-work. One or two volunteers accompanied the author on walks through the entire camp to ensure her safety and maintain respect and sensitivity towards occupants. During each visit, the volunteers asked occupants if they would like to speak to the author and let her photograph their shelters.

Volunteers have no authority when it comes to aid distribution, hiring, etc. as the official staff make these decisions. Furthermore, volunteers are obliged to not be pushy or authoritative because they wish to maintain the trust of refugees and IDPs. As such, there was no pressure on the refugees and IDPs to speak to the author and some did in fact decline to talk. However, most camp dwellers were very willing to cooperate and many of them approached the author to offer insights. This could be attributed to the fact that the primary author is a visible Arabic-speaking Muslim originally

from Iraq. Refugees and IDPs were very comfortable in these interactions, offering a lot of information about their situation. Some Syrian refugees only spoke Kurdish, but were still interested in offering insights through the Kurdish-Arabic speaking volunteers. In addition to occupants, the author also had conversations with the Danish Refugee Council (DRC), Norwegian Refugee Council (NRC), and the Emirates Red Crescent who handle most of the shelter and infrastructure projects in camps.

By the end of this visit, we had accumulated initial data on shelter and technology in the camps through observations, photos, and informal discussions with staff and camp occupants. Upon returning to North America, we analyzed the preliminary data and identified over 10 shelter types that fall on various points on the customization and permanency scale. The government and UNHCR keep a record of the improved vs. non-improved shelters (meaning shelter with or without a concrete utility core and tent base). However, this data is not up to date. The latest data from May 2016 does not capture standard vs. customized shelters, and is not available/accessible for IDP camps. A senior staff from the UNFPA-funded Al-Mesalla Organization for Human Resources Development also verified with camp managements that the only data available on shelters is binary (tent vs. improved tent) and no statistics exist on the exact proliferation of shelter diversity.

We designed a shelter-classification survey and our contact hired refugees and IDPs from each camp to do the legwork. The shelter survey contained a table with the shelters illustrated in Figure 5 (both picture and type) and a blank table for tallying the number of shelters that fall into each type. A survey sheet was used for each camp district then results were aggregated in one final table. In each camp, volunteers surveyed one or two districts (about 150 shelters) per day on foot and tallied everything in district-based tables. It took on average 10 days for two volunteers to cover each camp. Our contact, who has been visiting the camps daily for years, approved the survey and sanity checked the numbers. She also handled the hiring, payments, and data sharing using Viber; the communication method preferred over email and Skype in Iraq. During the process, some of the refugees and IDPs contacted us through Viber as well with questions about the survey (for example, if it was not clear which type a certain shelter belonged to) and shared camp photos.

Our contact also asked staff about architect involvement through a paper-survey with the following yes/no questions: did architects participate in the general design of the camp?, did architects participate in designing the camp shelters?, and did architects help refugees and IDPs in designing or customizing their own homes? Some opted to provide a short explanation next to their answer. These details were necessary since the role of architects is not well defined in official reports. Data collection from Debaga is still ongoing, as such, we will focus on the three camps we have data from, namely Darashakran, Kawergosk, and Baharka. Unless otherwise cited, the data presented in the rest of this paper has been accumulated either through our own field observations, surveys, or from verbal/Viber messages to NGOs on the ground. We also took notes while walking through the camps. We do not present any data from our interactions with refugees or IDPs.

Figure 2: Refugee-built concrete shelters in Darashakran

Figure 3: Modified tents in Kawagosk with a communal WC

5 CAMPS

5.1 Darashakran

Darashakran is located 40km north of the Kurdish city Erbil and is home to approximately 12,343 refugees. The majority of the population arrived from the Qamishli region in northeast Syria. They were first sheltered in transit camps Bekhma and Baharka then moved to Darashakran in late September 2013 [35]. The camp was established as a post-emergency permanent camp with an average area of 30m^2 per household as a response to a significant increase of Syrian refugee influxes into Erbil in August 2013. Compared to other nearby camps such as Kawargosik, Baharka, and Khazir, Darashakran is larger in size with approximately 1,150,000m^2 of land. As the camp grows, it is increasingly being described as "the camp that became a city" due to the fact that it contains concrete houses (Figure 2), shops, a school, salons, banquet halls, sewing factories and a mosque [10].

Currently, some of the main organizations active in it include: Agency for Technical Cooperation and Development (ACTED), which distributes food parcels, World Food Programme (WFP), IMC (International Medical Corps), and UNICEF Iraq. Organizations specifically involved in shelter upkeep and camp management include: UNHCR, DRC, ACTED, Islamic Relief Worldwide (IRW), Qandil (A Swedish Humanitarian Aid and Development Organization) and ERC (Emirates Red Crescent) [43].

Demographically, the majority of residents are Kurdish, mostly in the 18-59 year age group, followed by children aged 5-11 years [14] [37]. In late 2014, a shelter revamp process started, through which families received a tent on cement base along with concrete slab kitchen, shower, and latrine [36]. The process continued well into 2016, as more families arrived, and by June 2016, 2,100 out of 2,480 tents (85%) were improved [39]. These shelters (concrete utility core and cement tent base) are known as improved shelters.

5.2 Kawergosk

Kawergosk refugee camp was founded on August 15th, 2013 25km south of Erbil City. This permanent camp is smaller than Darashakran, occupying 419,000m^2 of land, with the majority of the space being used for makeshift tents that serve as housing for the residents. It has 9,234 registered refugees, also majorly of Kurdish origin from Qamishli. Key organizations actively involved with maintaining

the campsite include UNICEF, which provides water, medical, and school supplies, and UNHCR, KURDS, and IRW which all help maintain the specific shelter aspects and camp management [43].

Kawergosk is overcrowded as the number of refugee families is more than the planned capacity. With no new camp or extension of the existing camp planned, some of the refugee families will continue to live in emergency shelter [41]. In fact, only 22% of shelters have been improved in Kawagosk (Figure 3), compared to 85% in Darashakran.

5.3 Baharka

Baharka IDP camp (Figure 4) is located 10km north of Erbil and was founded on June 10th, 2014. Baharka was originally a transit point for Syrian refugees, then to Iraqi IDPs fleeing ISIS hostilities in the summer of 2014. It currently houses 4,164 IDPs on 283,165m^2 of land. Baharka is run by the Barzani Charity Foundation (BCF), a Kurdish charity based in Erbil, in partnership with other organizations such as the UNHCR and the WFP [45]. A survey from April 2016 [28] reveals that 82% of 997 shelters are tent on cement base (i.e. tent with concrete kitchen, shower, and latrines akin to Darashakran and Kawergosk) and 18% are caravans.

Figure 4: A street in the caravan district in Baharka

Table 1: Shelter types in North Iraqi camps

6 FINDINGS

We visited the four camps in October in spring-like weather and we were surprised from the onset by the mobility freedom afforded to camp dwellers, ongoing construction work, the availability of water and electricity , and how much some of the camps resembled towns despite their relatively young age (<4 years) — see Figure 2. Unlike Syrian refugee camps in Jordan for example, refugees in Iraq are free to leave and enter camps, and have residency visas that permit them to work legally. Across the four camps visited, we observed a wide variety of shelter types (Table 1). We found that the government and camp managers grant permissions and provide aid to allow resourceful refugees to convert parts of their tents or concrete shelters into grocery shops. Construction permits also enable financially capable occupants to overhaul their temporary shelters into concrete structures. Furthermore, we found that NGOs such as the DRC are steadily building infrastructure including sewage systems, roads, gravel pathways, and private concrete kitchens and washrooms for individual families in collaboration with the government. We briefly describe our classification of the observed shelter types before presenting our data on their proliferation.

6.1 Shelter Types

A. UNHCR tent: The signature UNHCR canvas tents are the universal standard when it comes to emergency shelters. The ones deployed in North Iraqi camps are the family version. It has 8 sides (6 short and two long) with $16m^2$ main floor area, plus two $3.5m^2$ vestibules for a total area of $23m^2$. It is made with un-dyed polyester and cotton blended fiber yarn. It is treated with a water-repellent, does not have a metal frame, is supported with metal pegs and poles [38], and is highly flammable according to the staff. Most refugees and IDPs were provided with special cooling devices (known as 'mobareda' and very common in Iraq) which are placed outdoors but cool the air on the inside through one of the ventilation openings. Our contact reports that there have been several deaths due to tent fires and collapse during storms.

B. Iraqi government tent: The tarp and metal frame tent is more rain resistant, has a uniform and airy half-circle cross section, and is more spacious and stable than the UNHCR tents.

C. Occupant-modified tent: These began as UNHCR tents but occupants removed the canvas material, designed and built wood or metal frames, added tarp insulation on the exterior, and even installed indoor kitchens. These are mostly found in camps such as Kawergosk where more durable shelters such as caravans and concrete were not introduced. Some occupants even installed fences and glass panels and converted them to shops. Occupants who have building experience or are skilled with their hands usually start customizations in their district and from there a process of collaboration and/or imitation propagates these practices.

D. Standard caravan: These immobile caravans are typically donated by the Gulf countries, Japan, or the US. They contain a built-in kitchen, washroom, and living/bedroom over a 2 x 6m footprint. Caravans are elevated on concrete blocks to prevent direct contact with the ground, but pests are still able to enter. Furthermore, overtime, water-based cleaning and household activities cause cavities in the caravan floors and pools of contaminated stagnant water

are common. Caravans are better than tents in terms of privacy, but they are also exposed to the neighborhood, which can be a source of discomfort given the conservativeness of these refugee and IDP communities. Caravans are also more weather-proof than tents and can withstand storms, but they are no better in terms of thermal performance. Their metal envelope absorbs heat in the summer and the cold in the winter. Fumes from cooking and oil heaters are another problem common to both caravans and tents. Caravans are usually assigned to highly vulnerable occupants, such as female-only households or households with sick members.

E. Occupant-modified caravan: The typical caravan modification entails the addition of a wood-frame extension clad with tarp and canvas outside the caravan either as a kitchen or foyer for privacy.

F. Tent with concrete kitchen and WC (known as improved tent): These are officially classified as "improved shelters", which the DRC or the government build before people move into the camp. This shelter typology is composed of typical UNHCR family tents that sit on a 30-cm high concrete base. Adjacent to the tent are three concrete rooms with built-in plumbing: a kitchen, a shower, and a latrine.

G. Tent with concrete kitchen and WC (improved tent) and occupant-built concrete rooms: This typology is identical to the previous, except that occupants would dismantle the tent, take the brick from the concrete base, and build one or more concrete rooms, using the tent canvas for fences and roofs. Occupants with more resources would roof their concrete rooms with either corrugated metal, kept in place with heavy objects or nails, or insulated roof panels attached to walls using screws.

H. DRC/UAE Red Crescent or other NGO-built concrete shelter with concrete kitchen and WC: These shelters are made of one concrete room and the aforementioned utility core. The kitchen and bathroom are not connected through an interior corridor to the main room, which serves both sleeping and living functions. There are design, quality, and eligibility differences depending on the organization in charge of construction. The Emirati Red Crescent shelters are plastered and painted, have fences and generously-sized windows in the main room, and are assigned to refugees and IDPs like any other shelter type. The DRC shelter model is different. Refugees and IDPs in need apply for a construction assistance program and if selected, the DRC builds one concrete-block room with one small window and all the necessary electrical wiring.

I. Occupant-built concrete shelter: These shelters, the ultimate sign of self-help and resourcefulness, range in scale from a single room to $150m^2$ domiciles with a courtyard, tiled-floors, swing, and a make-shift fountain (unfortunately, we were not allowed to take pictures of the few we visited). These shelters are financed by the occupants from different personal sources. Many refugee families we observed incorporate a grocery store in their design and it becomes their main source of livelihood. For some residents though, building in concrete was not an option due to illness or absence of a male in the household. Some of the women staff explained come from highly urbanized cities such as Mosul (Iraq) and Qamishli (Syria) and have no construction experience. And some are hindered by their physical condition (weight, fatigue, pregnancy). Ultimately

though, cultural norms constitute a strong barrier in a highly conservative society, where men oversee such tasks and women cannot negotiate with material suppliers and construction workers.

J. Other: Other makeshift shelters are made using corrugated metal, wood panel, cloth shelters, vacant tent lots, and other materials. These shelters are found when a camp is at full capacity or receiving rapid influxes of occupants. These structures are also common for shops as refugees and IDPs build them with whatever material they can find.

6.2 Data from Shelter Surveys

Despite their comparable age, the variety of shelter types across the three camps reflects the unique constraints at play in each camp such resources, construction permissions, and administrative models. The general propagation of shelter customization and permanent construction as self-help strategies are, however, unmistakably similar. We found refugees and IDPs augmenting their tents and caravans, coordinating expansions with their neighbors, and stacking concrete blocks. We both observed and were informed of many challenges with the design and construction process.

Each of the 10 shelter types can be categorized as customized vs. standard: types C, E, G, I, and J have been customized by their occupants while the others belong to the standard category. The shelter types can also be divided into permanent, semi-permanent, or temporary structures: types G, H, and I are permanent, while F is semi-permanent because the tent itself is made of canvas material while the core is concrete, and the other types are temporary.

From our survey, across the three camps, 80% of the 5,362 shelters have been customized, 54% are permanent, and 14% are semi-permanent. Table 2 and Figure 5 summarize the shelter types from our survey of the three camps. Interestingly, there is a large difference in the percentage of permanent shelters between Darashakran and Kawagosk despite their comparable age, but both camps have a very high rate of customization. Also, Baharka has almost the same percentage of permanent shelters as Kawergosk even though it was established nearly a year after it, but has a much lower customization rate.

	Darashakran	Kawergosk	Baharka
A	0	16	0
B	0	0	1
C	0	1,029	0
D	0	3	166
E	0	0	150
F	403	137	207
G	18	257	351
H	0	0	0
I	2,039	245	0
J	21	42	277
Totals	**2,481**	**1,729**	**1,152**

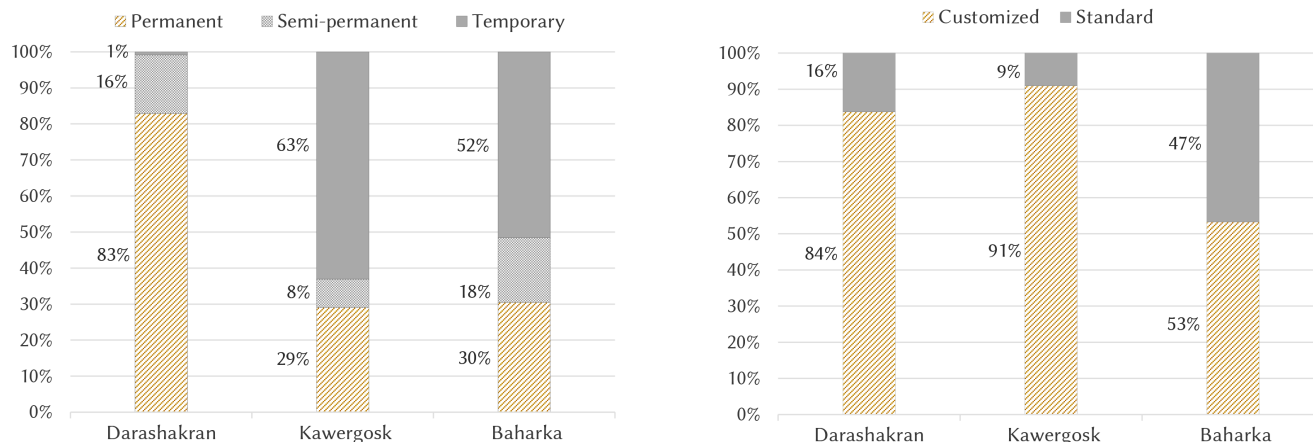**Table 2: Shelter breakdown by type**

Figure 5: Shelter permanency (left) and customization (right) by camp

6.3 Staff Input on Architects' Role in Camps

From our discussions with camp managers and staff members we also sought to understand the nature and extent of architects' involvement in the design and construction of camp shelters. The general notion is that occupants designed and built most of the customized shelters, sometimes even demolishing what they built (or what the DRC built) due to design errors. The UNHCR and DRC maintain engineering offices, and their senior staff mentioned having civil engineers on the ground. We saw that they also hire local construction workers and electrical engineers for building improved tents and providing construction assistance to eligible families. Due to the lack of data on this point, we asked a variety of NGO staff about what they know in terms of architects' involvement since they handle various kinds of relief work including shelter. We found that 66% of the staff report that architects were involved in the general design of the camp, 57% said architects were involved in the design of the shelters (they are referring to the standard NGO-built shelters), and 31% said that architects help residents build their own homes. Overall, it seems that the involvement of architects is both remote and sporadic. They are involved in the camp planning and shelter design (i.e. architectural work) but remotely (through the UN offices in Europe or the Middle East). Some NGOs such as REACH bring architects in to speak to residents and offer advice, but this was reported by only one out of 54 staff members. Another staff mentioned the presence of architects on the IDP camp management committee.

6.4 Tent to Concrete Dynamics

Our data indicates that refugees and IDPs in north Iraqi camps are building their own homes and that the transformation in the built environment from temporary to permanent structures is motivated by the poor living conditions afforded by the negligible privacy, safety, sanitation, and thermal comfort of temporary shelter provisions. Despite the inadequacy of temporary shelters being well-known, they remain the norm in camps, especially before the 5-year mark. One example is the nearby 80,000 refugee Zaatari camp in Jordan, established more than a year before Darashakran

and Kawergosk. Zaatari is still largely comprised of temporary shelter due to both host community and often the displaced population not wanting more permanent shelters. For the host government, permanent shelter suggests a trajectory toward eventual undesired naturalization and for the displaced it confirms the reality of their diaspora. In contrast, what we observed in the north Iraqi camps was surprisingly progressive, especially Debaga and Darashakran, which looked no different than typical Arab villages in the countryside. Articulating the policies and dynamics that enabled such difference in results is crucial for scale up.

Since 2014, the government of north Iraq has been steadily granting refugees and IDPs permission to build permanent shelters in camps, sometimes as early as 9 months after moving into the camp. What motivates the government's support for transition to permanence is not conspicuous. Our contacts recall several deaths incurred due to tent fires and storms, as well as extremely harsh winters, so permitting permanent shelters were necessary for humanitarian purposes. Furthermore, the Syrian refugees are predominantly Kurdish, and north Iraq is governed by a Kurdish party seeking an independent state.

Upon obtaining permission, refugees and IDPs design and build their own homes, even though the majority have no design or construction experience. The design and construction are both informal and iterative and no design tools are used except pencil and paper, which can introduce design errors. The initial builders are usually occupants who have formal or informal construction experience. Later, friends and neighbors enter into their own construction efforts through imitation, knowledge sharing, and community collaborations. In rare cases, construction workers from outside the camp are hired.

Concrete blocks and cement are the sole building medium used in permanent shelters since they are standard local materials. The construction unit, namely the block, lends itself well to the highly incremental construction process. Occupants constrained by money build what they can (while still living in a tent) and save up for the next row of blocks, a roof, window frames, etc. Furthermore, material entry into camp is regulated, and is subject to approval from the camp managers based on their "mood" or fluctuating safety

concerns. Restrictions placed on the entry of building materials can be in effect for months. In the camps we visited, refugees and IDPs can generally import 500 concrete blocks and request permission to bring in more at a later time. Families in dire need (have no source of income, no male, serious illness) can apply for help with construction. If approved, the DRC or another NGO builds a standard 1-room concrete block shelter. Occupants sometimes end up demolishing the DRC shelter and using its concrete to build a more customized shelter and reuse the free material, window frame, and roof panels.

Refugees and IDPs are allocated relatively decent plot sizes (70-90m^2 for a family of four to five members). Families of six or more receive two adjacent plots. NGO-built shelters have proper reinforced foundations and roofs and can support future expansion. However, refugees and IDPs do not build foundations due to the cost and/or knowledge gap. Their shelters are not stable and building upper levels will produce structural hazards. Many staff members have expressed their concerns about shelter safety during conversations and the survey. But because the only possible solution to accommodate growing families is to build up, in practice, no one has the resources to demolish their house and rebuild with a proper foundation.

Politically, the primary force enabling the tent to concrete dynamic are the agreements refugees and IDPs sign with the government that they own the shelter but the land remains the government's property. The displaced can be evacuated at any time and their shelters cannot be sold or inherited. Forced evacuation strategies include the seizure of identification, which means that residents will not be allowed to re-enter the camp after leaving and cannot use the various services inside the camp such as monthly rations and medical services. Eventually, residents without identification give in and leave the camp after exhausting their resources. Thus, while the shelters become permanent, their occupants are still considered transients.

7 DISCUSSION

The observations from the fieldwork and survey data presented in this paper provide a basis for exploring the role that ICT might play in giving displaced people more power over the design and customization of their shelters. Our study reveals far more diversity in how camps are organized before they hit the protraction stage than in previous studies [20], and offers new insights into areas of greatest need. Here we summarize these insights, before identifying design and intervention opportunities.

7.1 Camps are Not the Same

It is well known in the humanitarian relief sector that host governments are generally strict when it comes to permitting permanent construction in camps, especially prior to the 5-year mark [27]. Yet, we have found that is not the case in Iraqi camps. Refugees and IDPs have been allowed to build and finance a variety of construction projects. Our findings also notably portray a very different camp resident when compared to the stereotypical poor, helpless, and needy refugees and IDPs that are dependent on continuous NGO life support. The stereotype may certainly may be true in less "affluent" camps, but in the camps we visited, many residents

are employed, have freedom of mobility, and are not starving. Also in these camps, we found people with substantial human capital who often were well-educated, highly motivated, and have enough resources to take on some level of risk. Still, differences exist even between the camps we visited despite their close physical proximity and similar administrative structure.

Unlike Syrian refugee camps in Jordan, Syrian refugees and IDPs in these camps are permitted to leave their camps and work and for the most part are comfortable and hence willing to invest their savings and incomes to establish more permanent domiciles. These differences among the camps and their inhabitants result in very different long term outcomes. We cannot claim that that applies to camps in general. The unique political situation in north Iraq may have been the primary driver behind permitting proper shelter construction, but our findings suggest that in some camps at least, where political circumstances permit, shelter interventions that require some active participation, effort, resources, or risk on the part of camp residents is possible.

7.2 Permanent Shelters are Valuable to Residents

The problems with temporary shelters have been well documented in the literature [19] and were evident in the camps we visited. We observed overcrowding, inadequate indoor air quality, mold and pest infestation, thermal discomfort, absence of functional separation, complete lack of privacy (from the outside, and within the shelter itself), ease of intrusion, and extreme susceptibility to fires and destruction. As such, the few permanent structures sometimes found in camps are extremely valuable. One example we found was the abandoned warehouses built by American armies in north Iraq during the previous war. These permanent structures provide mass-shelters for refugees and IDPs during the emergency phase, and/or serve as bakeries and storage facilities.

The development of additional permanent structures is also good for the local economy. Construction provides employment for the local Kurdish population, IDPs and refugees who are hired to build concrete cores. Later, if camps are no longer necessary, the permanent structure can be used as housing for the poor or seeds for new communities. The difference in cost between a concrete shelter (4,000USD for a 70m^2) and a caravan (3,125USD for 12m^2) is not overwhelming. Overall, allowing camp occupants to invest their money, or channeling shelter-targeted aid money towards permanent construction has not only immediate value at low overheads, but also long-term value.

Beyond the immediately pressing challenges of supplying water and food to the displaced, we found that a huge demand existed for better shelter. The widespread practices surrounding modification and construction of shelters in the camps was remarkable given that residents did it completely on their own initiative. Even without formal help from organizations, residents with the requisite skills and financial capital were motivated to modify structures and construct new buildings. We witnessed this voracious demand in September 2016 when the government and Darashakran granted a wave of permissions to the newer camp districts; within three weeks construction in the newer districts was nearly completed.

7.3 (Localized) Expertise is Needed

Despite the impressive efforts by camp residents to customize and build their own shelters, the current ad-hoc approaches do create problems. Refugees and IDPs customize their shelters to varying degrees of permanence, including canvas tents, caravans, and metal to cement and concrete. The different outcomes are interesting and mostly fit the needs of their occupants, but their ad-hoc nature causes them to frequently suffer from design errors or construction flaws leading to significant safety and durability issues.

Because design is considered a luxury in camps, there is currently no involvement of architects in the design and construction of customized shelters. Assistance in the camp related to shelter is currently limited to overall camp layout and the design of standardized emergency shelters. This lack of architectural expertise leads to shortcomings in terms of inadequate shelter quality (specifically the lack of proper foundations and insulation), design errors (necessitating the demolishing and rebuilding in some instances), lack of safe expansion frameworks, and the exclusion of certain groups from the construction process, e.g. women-only households.

Finally, at all stages, shelter provision is superior when it is based on local decision-making that takes into account the context. For example, tents provided by the Iraqi government (shelter type B) are better than the UNHCR ones, because they have a metal frame, taut plastic sheeting, and secured foundations. They take longer to set up, but because they are context specific they perform significantly better. Another example is the unique cooling units which consume less electricity than conventional ACs. Such provisions do not fit UNHCR standards and other shelter-related organizations, yet they work very well for their context. So while architectural expertise may be needed, the proposed designs should be localized.

7.4 Opportunities for Design

The findings presented in this paper, such as allowing permanent construction before the 5-year mark, refugees financing construction, building without prior experience, and iterative design are rather surprising, progressive, and encouraging for camps. We cannot claim that they apply to camps in general, but the demand for shelter does exist. If the shelter dynamics in North Iraqi camps become the norm in the future, there will be a need to build one's own home regardless of experience. Given the fundamental necessity of shelter, shelter-related challenges could arise in many limits-related scenarios.

Given the scale and diversity of the problem, a "one-size-fits-all" approach to design is unlikely to work because each scarce context presents its own unique challenges. what this study points to is the need to empower refugees and IDPs in camps to design their own homes within the local constraints, and to build them despite the lack of prior construction experience. We believe that computing-related solutions, could augment conventional solutions from the architecture, political, and social science fields and offer new ways to approach the problem. Approaches that would work well in such a context could draw on traditions such as participatory design, custom fabrication, and information sharing.

Approaches that support participatory design would be valuable, because they give camp inhabitants more control over their situation, and can build on local knowledge about the specific needs and constraints of each family. Such approaches are well suited to use in camps as they tend to emphasize low-tech tools such as paper and pens for sketching, brainstorming, and reviewing. Smartphones, for example, could be used to capture and send designs for expert or automated analysis of structural integrity. Challenges include how to guide a design process towards architecturally viable designs without losing too much design freedom, and how to incorporate input from camp authorities and host governments without compromising the sense of self-determination of the occupant.

Digital fabrication tools offer exciting possibilities, although the idea of 3D printed houses [22] is likely a long way off. More interestingly, the tools for creating, validating, and sharing 3D models might be adapted for a community approach to shelter design, with libraries of open source shelter design curated by camp inhabitants themselves. There may also be scope to adapt algorithms that turn 3D models into a sequence of fabrication steps for situations where the construction is done manually rather than via a 3D printer. Perhaps the most useful application of digital fabrication is not the existing tools themselves, but the set of practices that have grown around sharing and modifying large collections of 3D models.

Finally, tools for knowledge sharing are needed to bridge the gap between expertise in architectural design and construction techniques and the local settings in the camps where such expertise is scarce. They include educational tools to provide instruction on techniques such as site preparation, safety, weather proofing, etc, and for capturing and preserving lessons learned within each community so that camp residents can help each other. These tools need not necessarily be digital, especially given the infrastructure constraints in camps. Recent offline-only and hybrid system architectures in ICTD could be applicable design directions [7].

8 CONCLUSION

Camps are increasingly being viewed as cities of tomorrow rather than temporary relief solutions due to the increasing influxes of refugees and IDPs and their protracted lengths of stay in camps. This situation requires the provision of adequate basic infrastructure in these de facto cities, including shelter. Yet camp shelters are largely absent from the research literature despite being a basic necessity. Instead, camp dwellers take it upon themselves to convert humanitarian built storage facilities into the domiciles, markets, and communities that they need. We conducted a field survey of 5,362 shelters across 3 camps in North Iraq, which reveals that 80% of the shelters have been customized by their occupants without architect intervention. Furthermore, despite the camps being relatively new, 54% of the shelters are built entirely of concrete and another 14% have concrete components. While some occupants did hire professional builders, most of the design and construction work transpired through informal self-help and community-supported processes. Though impressive and progressive, we found that these practices suffered from several issues such as inadequate quality, design errors, unsafe designs, and the exclusion of certain groups. We argue that in camp contexts where the widespread deployment of architects is impractical, several intervention opportunities exist to help support people in the design of their shelters, including participatory design, digital fabrication, and knowledge sharing.

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