Mobilizing Assets: Data-Driven Community Development with Refugees

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ABSTRACT

Asset Based Community Development (ABCD) is a promising approach for supporting community development in refugee communities. This paper explores the feasibility and effects of a data-driven asset mapping system as a community building tool in a refugee camp. Guided by participatory community building methods, We push the bounds of established ABCD methods by engaging community participants throughout the entire process of designing and collecting, but also managing, analyzing, and potentially applying the asset data. We use mixed methods, which include field notes, surveys, and focus groups to investigate whether asset data can be mobilized by the community itself, rather than by staff, to address its challenges and, if so, possible strategies for community members to utilize such data. Our three findings include: 1. Refugees in our study had the capacity to collect and up-and-download asset data, 2. However, they lack technical and statistical skills to utilize the data most effectively, and 3. Nevertheless, the process of collecting data contributed to a sense of community at the classroom level. Based on these findings, we offer several recommendations for use of data-driven ABCD in low-resource contexts.

CCS CONCEPTS

• **Information systems applications** → **collaborative and social computing systems and tools**; • **Human-centered computing** → *Field studies*;

KEYWORDS

Asset-based Community Development, Participatory Action Research, Community Informatics, Sense of Community, Data for Development

1 INTRODUCTION

Refugees flee communities in which they developed skills and capacities for full participation in economic and social life. Within these communities, it is likely there exists general awareness of the skills and capacities among their members. In displacement, whether in an urban environment or a refugee camp, awareness of skills and capacities is lost, if not significantly diminished.

This deficit is particularly problematic for developing community-level self-reliance. While the aid community, and in some cases broader legal structures, contribute to refugee community dependency, as their displacement becomes "permanently temporary" [45] and financial support wanes, the need for refugees to take the initiative to build their communities becomes crucial.

One approach, Asset-Based Community Development (ABCD), aims to mobilize a community's own resources to build a resilient and cohesive society [15, 34]. Assets can be categorized into physical, social, human, and natural resources [55]. Participatory ABCD engages various stakeholders, especially community members, in using their community assets to address challenges . To achieve this, techniques such as asset mapping are used. Asset mapping is the process by which community assets are represented by easily accessible data. The 'mapping' may involve a structure of categories relevant to the community's problems, and in some cases may include a spatial mapping of assets.

Ideally, the aggregated asset system, consisting of a database, and the means of collecting data and sharing analyses, becomes the property of the community with open access to all of the community members. Every member then has the freedom to access the data in order to mobilize the assets relevant to the problem they face. If participants are engaged throughout the whole process, this can maximize the effects of community building: every step creates further interactions between the participants and the other community members [6, 15]. This is especially useful for building social capital, promoting face-to-face community networks, and encouraging civic engagement, which are essential elements in community development[13]. To date, many ABCD mapping initiatives position local government or community mobilizers rather than community themselves as the data stewards and analysts.

Assisting refugees in becoming self-reliant has become a critical task. The United Nations High Commissioner for Refugees (UNHCR) and other aid agencies wish to assist refugees to achieve self-reliance even when it is still a state of emergency [55]. These efforts are necessary to help refugees adjust both immediately after they are displaced, typically in a state of temporary asylum, and after they are resettled to a more permanent location in the future.

While ABCD has been applied in urban and rural communities in the UK and US [13, 34], it is now just starting to be tested among

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refugee communities given their unique characteristics such as scarce resources, relatively low digital literacy, and vulnerable state of the community. Their displacement, and lack of knowledge or awareness of their community's assets, call for a specialized approach, namely data-driven ABCD. Data-driven ABCD overcomes the deficit of tacit knowledge of a community's assets by codifying the asset through digital data capture. The data can then be analyzed and communicated across all members of a community. Ideally, such a system would also promote equality among sub-groups by reducing the power associated with access to information.

Therefore, for this study, we aim to explore the feasibility and effects of a novel data-driven ABCD system with camp-based refugee communities, in which community members, rather than just development professionals, both generate and have access to the data. In particular, we examine:

(1) Is a data-driven, community-controlled asset-based community development system a feasible approach for refugee communities?

(2) Can engaging in the full process of developing data-driven asset-based community development increase refugees' sense of community?

(3) Are asset data valuable for refugees to solve individual and/or community problems?

In addition to using an asset system enabled by Information and Communication Technologies (ICT), we wish to find an appropriate way to both store the data and let refugees themselves access it, in addition to promoting their own ICT use.

2 RELATED WORK

Community building is a broad field of research engaging various disciplines such as sociology, politics, psychology and information science to achieve the common goal of promoting communities' socioeconomic status [6, 19, 53]. Given the diverse types of communities (geographical or virtual, co-located or dispersed [52]) as well as various approaches of building (e.g. needs-based, rights-based, and sustainable livelihood approaches [50]), community building research engages a diverse portfolio of expertise.

In this section, we discuss community building from two perspectives: asset-based, and technology-enabled community building.

2.1 Asset-based Community Development

Building a community that is resilient and sustainable requires an approach that acknowledges, utilizes and fosters resources within that community. This capacity-based approach focuses on "what people are able to do, on the quality of their life and on removing obstacles in their lives so that they have more freedom to live the kind of life that, upon reflection, they have reason to value" [46].

ABCD has been found to enhance civic participation, social capital, and the sense of community [13, 15, 16]. This approach is also found to enhance sustainability as it engages community members in decision making [6]. It is especially effective when participants have a strong stake in building their future [43].

For building refugee communities, an asset-based approach has been used by UNHCR in a number of countries under livelihood programs [55]. UNHCR classifies the assets into productive and livelihood assets [55]. As refugees are fleeing, they are left with

few productive assets. For example, cash and tools are scarce. However, their livelihood assets, which include human, social, physical, and natural capital (see Table 1), can help them regain productive assets and build their newly settled communities [55]. Since it is under livelihood programs, UNHCR and aid agencies' focus has been on promoting employment and small enterprise. Thus, interventions such as informal technical and vocational training and entrepreneurship training are commonly provided to refugees [55].

Table 1: Categories of Livelihood Assets Defined by UNHCR

Asset Categories	Components
Human Capital	skills, knowledge, work experience, physical ability to work and education
Natural Capital	natural or environmental resources such as clean air and biodiversity
Physical Capital	infrastructure and physical environment such as transportation, shelters, water supply and sanitation, energy and access to information and communication
Social Capital	network and connectedness, membership in certain groups

However, host countries generally have restrictive policies, frequently denying refugees the right to work, due to economic and political pressure from the host community. Only creative solutions which can benefit both refugees and local residents have the chance to be implemented [5]. For example, Betts et al. proposed the creation of an economic zone for displaced Syrians to join the Jordanian workforce, hoping to both bring employment to Syrians and promote industrial development in Jordan.

Nevertheless, these programs seldom facilitate refugees themselves in mobilizing their own assets to address the community problems they face everyday.

Generally, the common approach is to familiarize refugees with the assets in their living environment [13]. This starts with identifying the natural and physical assets, such as organizations, local markets, and financial systems [55].

However, from surveying the practices of asset-based community development in refugee contexts, we have not seen asset mapping used beyond physical or natural assets. In addition, the usage of the mapped data in decision-making is only in the hands of service providers and authorities. Nevertheless, together with the aid agencies on the ground, we have witnessed the strong demand for solutions to community problems that extend beyond what can be solved with physical or natural assets, such as gender-based violence and a lack of availability of child care. Therefore, we aim to include social and human assets in our study.

2.2 Sense of Community

One of the clearest measures of the success of community building is its members' sense of community. The concept of sense of community is widely studied in the area of community psychology [8, 42]. Numerous measurements on sense of community have been developed; however, it remains open to debate whether it should be a universal metric or context-sensitive [21]. The latter argues that the large variance in demographics, research sites, duration

and goals of community building projects require researchers to include context-depended measurements. Nonetheless, both sides all acknowledge the four major components: membership, influence, fulfillment of needs, and shared emotional connection, as developed by McMillan and Chavis [37]. Membership is "the feeling of belonging or of sharing a sense of personal relatedness", and influence is defined as "a sense of mattering, of making a difference to a group and of the group mattering to its members". Fulfillment of needs is reflected in "the feeling that members' needs will be met by the resources received through their membership in the group". finally, shared emotional connection is indicated by the commitment and belief that members have shared and will share multiple elements, including common places and shared experiences.

Many scholars have expanded and tested their own constructs tailored to many settings. For example, Long and Perkins generated a 12-item Sense of Community Index (SCI) for sense of community at the neighborhood level [28]. Chavis et al. revisited SCI and proposed a 20-item instrument called SCI-2 [9], which has been tested worldwide. Rovai's Classroom Community Scale is appropriate for a smaller scale investigation in classroom settings [48].

It has been found that sense of community has positive association with social change [35], social cohesion [56], participation [44], psychological empowerment [44], mental health [44] and lower levels of depression [44] in projects to promote public health, virtual communities [47, 49], and educational environments [48].

However, to date, we are unaware of refugee studies adopting this construct to evaluate their community building activities.

2.3 ICTs and Refugees

Displacement creates a variety of information and communication needs, including maintaining connections with family and friends, keeping updated on the news, and staying informed for making decisions about subsequent moves. Increasingly, these needs are being prioritized alongside the traditional 'staples' of food, shelter and safety. Especially with the high penetration rate of mobile phones and increasing availability of Internet access, the role of ICTs in facilitating displaced persons' lives calls for further analyses.

2.3.1 Stay Connected. Research into refugees' usage of ICTs has investigated urban, camp-based and resettled refugees [2, 10, 57]. Reports of use in well-established camps suggest refugees are eager to use social media for various reasons including communication with loved ones, feeling connected, overcoming isolation, and having their stories told [27]. In settled communities, refugee studies in communication focus on the differences between how information is delivered and received between refugees and service providers, which becomes important given the variations of culture, power, and language [4]. For example, Danielson examined ways of information delivery to the dispersed urban refugees in Cairo [10].

2.3.2 Rebuild Communities. Another major area of ICT application is to promote refugees' community building activities. Researchers from community informatics seek technological interventions to ensure sustainable community building [18]. From this perspective, ICTs are seen as tools or amplifiers to community building [22]. Digital products are designed and used for the whole community instead of individuals or representative users, which requires

long-term engagement with the support of both organizations and communities. Therefore, a reflexive and iterative approach is usually used. For example, for a project called come_IN@Palestine, refugees initially participated in the newly-introduced computer club to study, play, and extend their social networks with people from diverse backgrounds. Later on, refugee participants creatively engaged in further developing the computer club to suit for their community's needs [1].

However, the majority of the technological interventions for refugees' community building are implemented by researchers or aid agencies, and such interventions generally have limited refugee involvement. To maximize ICTs' effects in community building, we need to engage refugees in implementing and managing the system. Especially, both the system and data should be available to the community. Therefore, hopefully after the research ends, they can still benefit from the project.

3 RESEARCH APPROACH AND CONTEXT

Building communities calls for participatory approaches rather than merely enforcing top-down policy. This is especially important for communities that have unique cultural norms or are in difficult situations. Previous research has developed specific tools to help advocate this type of community building. In this section, we discuss these approaches and introduce our research site.

3.1 Participatory Community Building

Community-based Participatory Research (CBPR) is a collaborative process that equitably involving all partners in the research process recognizing the unique strengths that each brings [39]. It has been widely used in the area of public health with the goal of improving community health and eliminating health disparities [24, 39] as well as environmental research [29]. For example, collaborating with a Somali refugee community, Johnson et al. examined how attitudes, perception and cultural values influences women's use of reproductive health care [24]. A conception of **community** rests at the heart of this methodology.

Another similar approach is called Participatory Action Research (PAR), which has been adopted in numerous research areas, such as psychology, sociology, education, and agriculture [11, 31]. Despite its wide adoption and varying definition, there are a few important underlying tenets as proposed by McIntyre[36]: "a collective commitment to investigate an issue; a desire to engage in reflection to gain clarity about the issue; a joint decision to engage in individual and/or collective action that leads to a useful solution; the building of alliances between researchers and participants in the planning, implementation and dissemination of the research process." At its core, **action** is regarded as a critical part of the research process. Some scholars emphasize a recursive process of exploration, knowledge construction, and action [36]. They emphasize the main purpose of collecting and analyzing data as taking further action and enacting change [30]. Other scholars focus more on the democratic aspect of PAR, which advocates empowering participants to be involved in the decision making process [38].

Even though these two share more features than they differ, we combine their core values in this study: *community* and *action*. This can guide us to collectively inquire into the community's real

concern, together act upon it to effect real change. Participants are not only the subjects of study but also active contributors.

3.2 The Za'atari Refugee Camp

As Za'atari has become a hub of innovation, general background on this context can be gleaned from extant research (see [12, 57, 58]). There are also numerous media accounts, as well as a movie called "Salam Neighbor".

In protracted crises, refugee camps may evolve from a transitional population center to a more complex and stable ecosystem. When Za'atari was first established, no infrastructure was in place. After five years, as residents are not allowed to leave the camp freely without a permit, much effort is put toward building households, neighborhoods, and communities. In addition to meeting basic needs such as food and shelter, the majority of the districts have community centers built by aid agencies to organize community activities ranging from computer classes to community gatherings.

In terms of mobile phone and Internet use, from a non-representative survey study on refugees' communication behaviors, we know that mobile phone and SIM card penetration rates are 89% and 85% [57]. While it is impossible to surmise the exact penetration rates, these results are in line with the relatively high penetration rate (90%) of prepaid SIM cards in Syria [17]. Moreover, the study showed that the most common way to access the Internet was through cellular networks. While there are 4G wireless Internet connection provided in community centers, refugees are only allowed access at fixed times throughout the day. Outside of these community centers, due to security concerns resulting in a 'throttling' of cellular data services in the camp, refugees only have basic cellular service to send texts and make phone calls, with very rare access to the Internet. Despite these limitations, UNHCR and other service providers are interested in the mobile phones as potential bases for information distribution and as platforms for social service programs.

4 ASSET MAPPING SYSTEM

The asset mapping system design needed to meet several goals and constraints. As previously mentioned, it must be fully implementable by the refugees. This created two primary requirements: (1) a system that allowed for collective data storage and access, and (2) that the system meet the dual needs for data privacy protections, but at the same time public access and use. A secondary goal was the design should scale beyond Za'atari camp. As will be described in greater detail in the coming sections, the resulting system consisted of technical components including UNHCR Kobo server located in Copenhagen, mobile handsets for data collection, and computer labs in camps for training and eventual access to and use of the data [1].

To develop the system we devised a procedure to train refugees and a tool to manage the asset data. We designed the framework collaboratively with other members of the research team and the service providers; it is shown in Figure 1. The asset mapping procedure has three stages: planning, implementation and utilization.

[1]A separate yet related project to create geographic maps of the asset data is described here [not disclosed for confidentiality]
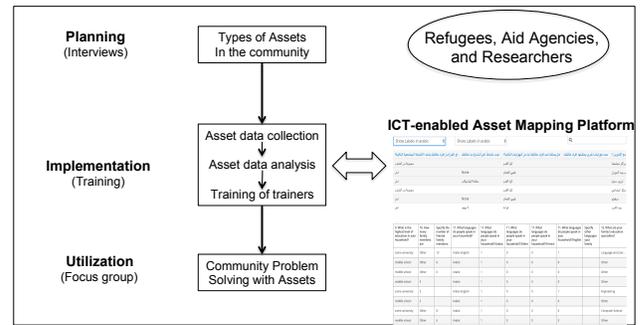
Figure 1: Flow of Asset Mapping

The system's development begins when asset data is collected in the form of a survey. The survey instrument includes several tentative **categories** to map the types of assets, such as:

(1) Membership in community programs, hobbies, and social activities
(2) Educational background and skills
(3) Work and business
(4) Places and tools to access information
(5) Time that can be volunteered for the community

To fulfill our dual needs of data privacy and public accessibility, the data collection process was designed to avoid collection of personally identifiable information (PII). Thus, the asset data is collected at the household level and location data is collected at the block and neighborhood levels.

It is important to note that typically, to be actionable and effective in decision making, as well as to show specific impact to meet accountability demands [32, 33], humanitarian data are collected at the individual level and include PII. As a result, data access is very tightly controlled and constrained to the organizations. Consequently, our approach was unique and a fundamental change for our partners, who hoped that while the system was being designed to meet refugees' needs, it would be useful to them as well.

4.1 Asset Mapping Process

In the following paragraphs we provide a general process derived from our multistage research project.

4.1.1 Planning. The first and foremost step is to decide on the types of assets that are most valuable to them. After conducting interviews with the residents and agencies in the selected community [25], the next step is to finalize the specific asset questions under the suggested asset categories based on their importance to that community. After finalizing the types of asset data to be collected, a digital form is created and uploaded to the Kobo server in order to test it within the local context.

4.1.2 Training with Refugees. The implementation phase begins with conducting training sessions on the use of the asset system with a group of refugees.

(1) Knowledge Sharing

We first seek to involve trainees in understanding what asset-based community development is. To achieve this, we begin by discussing what asset means to them. We also show slides with pictures of potential assets, which include physical assets such as community centers, schools and supermarkets. Additionally, we provide examples of human and social assets like their relationship with their neighbors, personal skills, and work opportunities.

Next, we introduce to the trainees the procedure of the asset mapping project. We start with the structure of the asset mapping system shown in Figure 2 and then lead the trainees step by step in how to access the Kobo UNHCR server, and how to configure ODK Collect to access the survey of assets. Lastly, we show them how to upload completed surveys to the server.

(2) Asset Data Collection

Next, the participants are trained on how to conduct survey-based data collection, including how to ask for permission and control for quality. Then, a representative population of potential survey participants is found using a systematic sampling method based on the current information of households in the camp. The trainees are then grouped into teams and assigned an equal number of households to visit. During the data collection phase, every team visits a list of households, which includes the detailed address information for each household. Everyday, we set a time for each trainee to come back to check on the progress and make adjustments for the next day. Afterwards, the collected data is checked, uploaded and aggregated in Kobo UNHCR for further usage.

(3) Asset Data Analysis

After all the households' asset data have been collected, we conduct different levels of data analysis with the trainees. We either use Kobo's online built-in data analysis tool (diagrams and tables) or download the dataset in various formats (e.g. xls and csv) and use other software to analyze it.

With the built-in analysis tool, trainees can navigate through and generate the basic descriptive statistics and diagrams for each asset question: for example, frequencies, percentages, and histograms. In addition, trainees can view the raw data to see example entries.

Analyses are driven by the questions or interests of each trainee. So the trainees are asked to identify interesting assets to investigate, and the researchers help them develop strategies to analyze the data accordingly. For example, if a refugee trainee wants to know what languages people speak in the camp, she can go to the language question and use the histogram tool to show all the answers.

4.1.3   Exploring Sustainable Asset Use. There are two options for promoting the future use of the data: first, engaging community members to examine how asset data can be valuable in addressing the challenges they face; and second, training trainees to manage the asset mapping procedure for future iterations of data collection.

(1) Transfer Data to Community

In our study, we host focus groups with community members (other than the trainees from our training) to explore their perception of the data's perceived usefulness as well as their potential implementation plans for addressing community problems using the asset

data. The detailed method of conducting such focus groups will demonstrate later in the method section.

(2) Handing Over - Training of Trainers (TOT)

As another major goal of the asset mapping project is to provide the techniques for refugees to conduct similar projects by themselves in the future, we conduct a session of TOT. We invite several of the trainees who are interested in further advancing their skills in asset mapping. The two main components of this TOT are asset form management and project management. Asset form management includes creating and deploying asset data collection forms in Kobo, and project management primarily concerns controlling access to the data, such as who can access, edit, and contribute to the database. Importantly, our own study relied only on tools that could ultimately be used by the refugees for their own purposes.

4.2   ICT-enabled Asset Mapping Platform

Figure 2 illustrates how the ICT-enabled mapping platform works: the Kobo UNHCR server (kobo.unhcr.org) hosts asset data collected using ODK Collect (opendatakit.org).

In more detail, the trainees in the community center/computer lab will first have Android devices configured to use ODK Collect. Later, after data is collected through visiting individual households, the filled forms on the individual devices are uploaded and aggregated. Importantly, this process does not require consistent or widely-available Internet, as data can be collected without Internet access, as data can be collected offline. Finally, the aggregated data will be made available for access and use by both the trainees and the population at large.
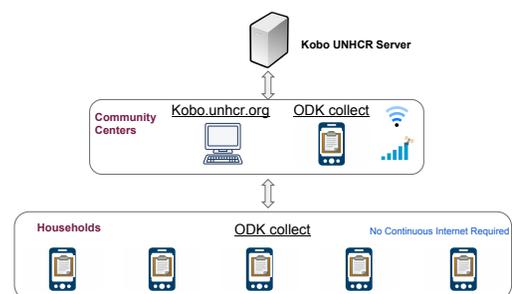

Figure 2: The ICT-enabled Asset Mapping Platform

4.2.1   Kobo UNHCR. Kobo Toolbox (www.kobotoolbox.org/) was created by the Harvard Humanitarian Initiative to help humanitarian workers collect and analyze data. It allows project creators to grant edit and view rights to the collected asset data and log onto the system simply through an URL. Therefore, refugees from the community who have the URL can view and analyze the assets freely using both mobile phones and computers.

Kobo Toolbox also collaborates with different organizations to maximize its impact: such as, UNHCR. Kobo UNHCR provides another layer of data protection by allowing UNHCR to host the data in their own rather than Kobo Toolbox's server, which also reflects their need for control over refugee related activities.

4.2.2 ODK Collect. Open Data Kit, which is supported by the University of Washington, allows data collection using Android devices even when there is no persistent Internet connectivity available. However, it does need Internet to upload data from completed surveys to a server. Kobo Toolbox integrates with and enhances ODK Collect's functionality.

5 RESEARCH METHODS

Implementing and testing the proposed system was conducted in the following way. We use mixed methods to investigate the usage and impacts of the whole asset mapping activity. Throughout the study, a Syrian refugee was hired as our translator.

5.1 Recruitment

To recruit refugees to participate, we worked closely with our collaborators as their knowledge is invaluable in identifying the potential users and coordinating the required resources. There are three main guiding principles regarding the recruitment of the trainees. First, they should be over 18, or over 16 with permission from their parents. Second, trainees should have basic digital literacy (i.e., experience in using mobile phones and the Internet). Last, they should comprise diverse demographics, such as age and gender.

5.2 Field Notes

Various qualitative research methods are used to evaluate the study in as much detail as possible. We took field notes and photos throughout the stages of the study to generate contextualized and localized solutions. Given refugees' security concerns, photos were taken only when granted permission from the refugees.

5.3 Survey

Surveys were issued to quantify trainees' perception of the effectiveness and usefulness of the asset mapping training. We used the *Classroom Community Scale* constructed by Rovai [48] and designed our own *Perceived Effectiveness* scale. The primary reason to use Rovai's scale for measuring the sense of community is based on the fact that we conduct our training sessions in a classroom setting. We designed the 7-item Perceived Effectiveness to get feedback on every procedure of the asset mapping activity. Example questions include: " Asset collection helps me engage more with my community", and "Asset analysis in the lab helps me become more aware of the assets in my community". In order to gain additional insights into the asset mapping platform itself, we also issued *Perceived Usability* designed by Brooke [7].

All of the questions use a 5-level Likert scale, representing "strongly agree", "agree", "neutral", "disagree", and "strongly disagree". The survey is presented in both English and Arabic, and it is issued in pen-and-paper form at the end of the training.

5.4 Focus Groups

Focus group interactions are a valuable source of qualitative research data [26, 41]. As training was conducted with only a small portion of the community, we hosted focus groups to explore the perceived usefulness among those who were not involved in the data collection. The focus group discussions examined whether and how the collected asset data can help community members to solve their problems. This is particularly important: ultimately, after the research team departs, the community members must make use of the asset data for the intervention to have been useful.

The focus groups were conducted with a facilitator (one of the authors), one or two translators (generally the organizers of sub-communities' meetings), and 8-20 communities members depending on the sub-communities' sizes and their availability at the time.

We also invited trainees to explain the asset system to the focus group participants. After the brief introduction, the discussion was guided by the following four questions:

(1) What are the problems that you and your community are facing?
(2) What assets are interesting to you?
(3) Can the asset data be used in solving those problems, and if so, how?
(4) Do you plan to use the data to implement your ideas? Can you develop a course of action to solve the problem?

The last question intended to incentivize participants to engage in strategizing potential solutions. As attitudes can be relatively idealistic, intent takes account of practical limitations and opportunities and links the participants' current attitudes to their future behavior [14].

6 RESULTS

We used the described framework to conduct the study during the summer of 2016 in the Za'atari refugee camp. The study was conducted in collaboration with refugees, UNHCR, and a US non-governmental organization (NGO) International Relief & Development in Za'atari. Our analysis discusses participant demographics, general perceptions of asset mapping activities, refugees' engagement with training, sense of classroom community and gender differences, and community members' views of the data.

6.1 Participants

In total, we interacted with two groups of participants:

(1) **47 trainees** from three asset mapping training sessions.
(2) **44 participants** from four focus groups.

6.1.1 Participants from the Training. We conducted three training sessions in three out of twelve districts in Za'atari. Each training session took place in a computer lab located in community centers provided by our collaborators. Every computer lab is equipped with fifteen laptops, one projector, nine Android tablets, and a 4G wireless Internet connection.

In total, we collected asset data from 338 households. Table 2 shows our participants' basic demographics and their data collection results from each session.

Table 2: Summary from Each Training Session

Session	Participants (F)	Age (Mean)	Households Visited
1	14 (0)	17-33 (24)	112
2	11(3)	18-30 (25)	115
3	22 (14)	17-65 (34)	111

6.1.2 Participants from Focus Groups. We hosted four focus groups to understand the potential usage of asset data with four existing sub-communities in Za'atari, which include community leaders, youth committee members, women committee members, and health volunteers who work for an aid agency.

Community leaders are respected community members; they are usually religious leaders such as imams. Committees, such as youth and women committees, are sub-communities organized by UNHCR to help advise on policy making and community building. The health volunteers are refugees who were doctors or nurses in Syria who are now employed by an aid agency to help promote health care in the camp.

All these sub-communities meet regularly in community centers that are nearby and available for such meetings. We took advantage of their meetings to host our focus group discussions. Each focus group lasted between one and two hours. All these discussions are facilitated by organizers either from UNHCR or other aid agencies. Table 3 shows the basic composition of the focus groups.

Table 3: Participants of Four Focus Groups

Sub-communities	Leaders	Youths	Health Volunteers	Women
Participants (F)	8(0)	11(3)	15(7)	10(10)

6.2 Refugees' Perception of the Asset Mapping

Recognizing the likelihood of acquiescent response behavior, we find the trainees were generally positive about the system's effectiveness but less so about its usability. We measured the **usability** score of trainees' perceived usability on the asset system [7]. After scaling, the score is 66 out of 100, which indicates only a moderate level of usability. The reasons for this moderate usability might be explained from two perspectives. First, the asset system itself was the first product of its kind introduced to the refugee community. Among the 41 trainees who answered the survey, 12 of them found it was unnecessarily complex. Second, relatively low literacy in digital technologies sets obstacles for refugees to make sense fully of the system which comprises a server, a computer, and a mobile device. There were 12 trainees indicating that they need the support of a more technical person to be able to use the system, and 8 trainees felt that they need to learn a lot before they can comfortably use the system. Therefore, the system itself could be modified to be more usable, and additional training could help increase the perceived usability.

Out of the 47 trainees, 41 answered the survey on **perceived effectiveness**. Measures of effectiveness included whether the activity improved their awareness of their community, helped them engage with their community, raised their awareness of assets, raised their sense of responsibility toward the community and felt they could use the system. There were 36 trainees who agreed or strongly agreed that the asset mapping experience improved their awareness of their community; 37 trainees agreed or strongly agreed that asset data collection helped them engage more with their community, and 39 trainees agreed or strongly agreed that asset data analysis helped them become more aware of the assets in their community. In addition, 32 trainees agreed or strongly agreed that asset data will be useful in solving problems in their normal lives, while 39 trainees agreed or strongly agreed that helping others using the asset system could increase their sense of responsibility in building a better community. There were 32 trainees who expressed that they would like to use the asset system frequently, and 36 trainees who believed that they are confident to use the techniques learned to conduct similar project for their community in the future.

In addition, issues like power shortages, Internet instability, and limited hours to use the computer labs further hurdle the usage of the asset system.

6.3 Refugees' Engagement in the Training

The survey showed that 29 out of 47 trainees felt they served as co-researchers in this asset mapping project. Gathering in a group with others from their community with the goal of searching for answers of community problems makes them feel that they are crucial and responsible members in the community.

6.3.1 Asset Data Collection. Figure 3 shows the typical process of data collection the camp: a team of refugee trainees use an Android device to facilitate asset data collection with members of a household that they visited.

Figure 3: Data Collection

During the data collection, we also hosted daily meetings (shown in Figure 4) to get feedback from trainees' experience. These are extremely helpful to adjust plans for the next few days. For example, when a household was unoccupied the day our trainees visited, they could add that house to their route for the next day. Trainees also collected feedback on the asset questions from the households, such as adding another choice or another asset question.

6.3.2 Asset Data Analysis. The trainees were interested in a wide range of assets, from languages, computer skills, to job opportunities. Even though they were keen to gain more information on jobs and skills, females and males expressed different interests in community assets. For females, they were interested in a wider range of assets including art, sewing, nursing, food, and education for children. Conversely, males were more job-oriented. Trainees were surprised to find out that, collectively, their community has a wide array of assets. For instance, one trainee who wanted to learn foreign languages found there were community members who knew French, Russian and Latin.

When analyzing the asset data, trainees who had clear interests in certain assets preferred to first obtain the basic statistics of those

Figure 4: Discussing Data Collection Experience and Strategizing for the Next Day

assets, such as frequencies, using the built-in visualization tool in Kobo Toolbox. However, for trainees who had no particular interests, they would like to explore the raw data sheets in order to gain a preliminary understanding of the types of questions they could ask. Later, after determining which assets they were interested in, trainees sought to find out if anyone in their own neighborhood has that asset. In general, the data analysis is challenging due to the lack of demand or skills among the trainees. Most of the trainees focused on asking and answering simple yes-or-no questions: whether such an asset exists, for instance. However, this only reflects a small portion of what the data can offer. Figure 5 shows trainees participating in the asset mapping training in a computer lab in the camp.
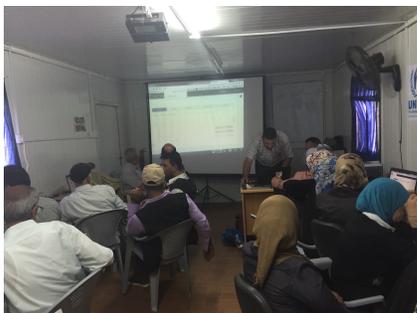
Figure 5: Training in a computer lab (a Syrian was showing his procedure of analyzing the asset data)

6.3.3 Training of Trainers (TOT). From the three-day TOT activities with the four trainees from the training, we found that three days of intense training is not enough for them to take charge of future asset mapping activities. Even though they certainly have the potential to conduct and manage the system, they lack some of the required implicit knowledge and would need more time to acquire it. This could include dealing with Internet and electricity issues and controlling the quality of the collected survey data.

In summary, there are adequate human resources within our sample in the Za'atari refugee community. From the training, we witnessed that refugees have the capacity to be trained on data collection, data storage and analysis to build a sustainable community.

Nonetheless, more time is required before they could take over the complete management of the system from a technical perspective.

6.4 Sense of Classroom Community and Gender Differences

As our asset mapping training was conducted in a classroom setting, we intended to measure how it contributed to the participants' sense of community. According to data from Rovai's 10-item Classroom Community Scale, we found that trainees expressed a moderate sense of classroom community after one week of training, with the value being 68 out of 100. Normally, the scale is used after at least one semester of classroom community building. However, for this pilot study, we only had one week for each training session.

This construct shows two dimensions of the sense of classroom community: one is about building connections, expressing care, and building reliance and trust; the other focuses on providing timely feedback, delivering learning results, and creating opportunity and desire to learn in the classroom. Our result shows that both have similar median value being between "agree" and "neutral".

In Za'atari, classes following the Jordanian curriculum are offered to males and females separately, while our training was offered to Syrians without restrictions on gender with the consultancy from our collaborators. From the training experience, we observed that trainees tended to sit with people who are of the same gender. However, there was a self-organized team with mixed gender and age: two young females and two senior males. Even though they confronted difficulties, they managed to solve them through further communications mediated by the instructor.

Younger females were more active in expressing their opinions in front of seniors or males when compared with older females. In a tribal and patriarchal culture, females' participation in social, economical and political issues are lower than males [40]. Nonetheless, studies have found that community driven development increases females' participation and their community decision-making, even in societies where females face extreme discrimination [3].

6.5 Asset Data: How Community Members Respond to it

Next, we present results from our four focus groups. None of those recruited for the focus groups were involved in the data collection process at any other stage.

6.5.1 Community Leaders. They claimed that they already knew all of the information about their communities. The asset system only reinforced their existing knowledge of their communities.

6.5.2 Youth Committee. Youths were mainly concerned about the lack of Internet connectivity. Youth committee members, whose ages fall between 16 and 24, were not particularly active in engaging in community activities with other youths. However, when one participant mentioned that some kids were dropping out of school and getting abused while in school, many agreed. When the facilitator asked for potential solutions for this problem, youth participants were not sure what they could do to help ease the situation, let alone knowing what asset data could be needed.

6.5.3 Health Volunteers. According to the health volunteers, they did not feel they had much control over key issues of health, such as the lack of doctors. However, there were numerous health related community development challenges they faced everyday when doing their volunteer work. For instance, there was a strong need to have effective mechanisms to disseminate health information. The main approaches they used were face-to-face discussions and handing out leaflets on how to take medicine, prevent diarrhea, take vaccines, and deal with chronic disease. It was not as effective as they wanted. However, group discussions could raise privacy concerns around health issues. Another job responsibility is to promote a healthy lifestyle, such as encouraging people to quit smoking or to have a healthier diet. There remain difficulties in changing the culture, as community members can have limited trust in doctors and may refuse to admit when they are sick. Nonetheless, a creative health promotion program has the potential to build a healthy community by using a community-led approach. For example, participants suggested that they can design programs to match gym-goers (recorded in the asset system) with obese people.

6.5.4 Women's Committee. The Women Committee was the most active and passionate in engaging in building their communities. They had already been identifying challenges, especially regarding to women and children, and seeking solutions amongst themselves. They grasped the idea of asset-based approach the fastest among the sub-communities. Existing community building activities initiated by women in the camp are common. Many of them are already actively taking care of their neighbors. One former teacher takes care of a group of youths everyday including kids in the neighborhood or even those from other districts. This was only possible because she was a trusted community member.

The Women Committee also acknowledged that many challenges remain, such as retrieving water safely, reducing gender-based violence, preventing early marriage, having better treatment for mental illness, bridging the inequality between men and women, having electricity during the day so that they can do certain house work, changing the age limitation on courses like computer and English classes, having more advanced sewing classes, and improving the food quality. Among all these problems, some were deemed solvable and some were harder. Still, our participants strongly believed that problems are being solved and others can be solved. When we explored what asset data could help facilitate their community building, they still had difficulty determining what type could be useful, even though they felt overburdened with their own work.

Our focus group results demonstrate 3 distinct challenges for data-enabled ABCD. First, it is important to identify for which community members the asset data will be useful. Women, more likely to be cut off from broader information sources, may be a good target. Second, it is crucial to find problems for which information can be an important part of the solution. For example, it will not provide a pay check. Third, the effective use of asset data presupposes a sense of agency and analysis that must be included in ABCD programs.

7 DISCUSSION

We are going to discuss our results from two major perspectives: practical design implications for data-driven asset system and theoretical contribution to ABCD in low-resource communities .

7.1 Design for Community-Accessible Asset System

We first discuss four key issues regarding to the system design.

7.1.1 Open Data to Serve Communities. One of the premises of the asset-based community building approach is that community assets are of the most value for community members to use than researchers or aid agencies. Conventionally, in humanitarian settings, data are collected for monitoring and evaluation purposes to ensure effective service provision, to establish baselines in support of funding proposals, and to conduct research [23]. Rarely, service providers ensure the collected data is accessible to their served communities, which could entail various privacy and security concerns.

The ultimate goal of the asset mapping project is to provide a community asset database which can be integrated into refugees' daily problem-solving and to generate insights for the general ABCD community. We designed a publicly shareable and accessible asset system which does not contain personally identifiable data.

7.1.2 Data Collection to Enhance Sense of Community. In this study, we are developing infrastructure for an ongoing ABCD, instead of tackling a specific ABCD challenge. Thus, this may not have the benefit of tangible results and problems solved, like setting up the daycare. However, what we do show, and it is important, is that using participatory approaches even where the overall project is not fully successful, we witness improvements to sense of community.

Therefore, we recommend that, especially for communities who lack awareness of assets, there are many benefits to engaging members in data collection. A study conducted by a community development team in the U.S. at Yale University using high school students to map only physical locations reached similar conclusions [51]. However, here the type of asset data collected is more complex. These results suggest building up an asset database over several months or even years by rotating various community members through training and data collection activities may raise general awareness of assets even if the actual dataset remains unused.

7.1.3 A User-Friendly Interface to Promote Usage. In our study, we hosted the data on UNHCR's online server so the community can access the data through just a URL. As mentioned, refugees then can search for descriptive statistics or simple visualizations of asset data through Kobo's built-in analysis tool. During the training, one trainee also suggested that we can make a "Za'atari Google" so that refugees can easily request asset-related data. Given the time constraints, we did not create such systems to better represent and make use of the asset data. We can envision that, a more usable system, not only can we promote its usage but also help us monitor the roles of data in refugee community building.

7.1.4 Co-produce a Sustainable Community with Multiple Stakeholders. This asset-based community building project can not be successfully implemented without the commitment of every stakeholder, including the refugees, service providers, research team, and host government. Collaborating with service providers and refugees is not trivial. Service providers already have full schedules of obligations; refugees already have their own daily challenges.

Thus, effective collaboration requires delivery of a useful product while managing expectations [54].

Nonetheless, our common goal is to ensure the development of refugee communities. Invaluable local knowledge from the service providers is one of the researchers' greatest assets, from testing the feasibility of the system and assisting in coordination, to implementing the project and brainstorming for improvement. Last but not least are the refugee participants. They are the main contributors to building the system, as well as being responsible for its future use and improvements.

In addition, the exposed complex community problems like gender-based violence, poor health care, the lack of daycare, and poor school attendance rates require attention from all community members. Making direct connections between assets and problems requires a multifaceted approach. First, it is important to promote refugees' awareness in their ability to take a proactive approach in addition to the existing humanitarian approaches. Second, we need to work to help increase refugees' agency in data analysis and creative action. Lastly, service providers need to be informed and understand the approach, as training them as a mediator can bridge some of the refugees' challenges in dealing with the asset data.

7.2 Asset System for Refugee Community Development

We examine the asset mapping system in refugee communities for the first time to understand its roles in community building.

7.2.1 The Process of Asset Mapping Contributes to the Sense of Community. While our test of sense of classroom community provided only moderate support, this study conducted among refugees suggests it may be possible they do not share a sense of 'having a stake in building their future' [43]. Also, the approach taken here also demonstrated that ABCD can be approached in stages. While the goal here was to build the system, just the process of trying to build the system can have positive effects. So smaller projects contributing to a larger vision may have immediate effects to sense of community.

7.2.2 The ICT-enabled Asset Mapping System Improves Refugees' Technical Skills. In our case, it is beneficial that in addition to raising awareness of assets the trainees gained potential valuable technical skills. Majority of the ABCD research only use geographic information system to measure physical assets [20, 51]. Our approach is novel in that it involves community members not only in the data collection phase but positions them as the owners and managers of the entire data system. Therefore, it pushes the current bounds of participatory ABCD approaches.

7.2.3 The Choice of Asset Data to Accommodate Different Purposes of Community Development. With different levels of agency and self-efficacy across sub-communities, there are various needs for acquiring and using asset data. After focus groups with four different sub-communities, we witnessed both similarities and divergences among them. Between community leaders and youth committee members, because of age and authority, community leaders claimed they were aware of all the assets and challenges in their community, while youths recognized some challenges but knew less about finding solutions. Both women committee members and

health volunteers are active in contributing to their community. However, health volunteers, with a specific job in mind, recognized all the problems but felt that they had limited power to make a real change. Women, on the other hand, acknowledged all the small or big problems and acted actively to make a difference. Nevertheless, they found it hard to seek resources outside of their own circle.

These results cause us to revisit the planning of the types and granularity of the asset items used in creating the asset dataset. The dilemma is that general assets have the potential to be used by a bigger audience in various way while specific assets can target specific problems with limited community members.

7.3 Limitations and Future Research

Last, we summarize limitations and envision future development.

7.3.1 Asset Mapping in Different Refugee Contexts. We have only tested asset-based community development with camp refugees, who are located in a confined geographical area. However, the majority of the refugee population are scattered throughout urban areas. There are pros and cons for both camp and urban refugees. We expect their experience to differ along two major axes. First, camp refugees might have higher sense of community than urban refugees. As camp refugees tend to come from neighboring regions, they are likely to bring some of their existing social network with them. In addition, refugees live together in the camp, which makes it easier to build a community together. Second, the idea of asset-based community building is based on the premise that refugees have more freedom to mobilize their resources. Camps, compared to urban contexts, have more restrictions.

7.3.2 Measuring the Effects of Asset Mapping. The use of our survey to evaluate the effectiveness of the asset system is only for description. In order to quantify the effects such as sense of community, a better controlled field experiment with pre-and-post surveys will be needed. This will require a longer term of implementation.

8 CONCLUSION

This study explores the feasibility and effects of a data-driven asset mapping as a long-term community building tool in a refugee camp. The concept of asset mapping emphasizes on mobilizing refugees' capacities to fulfill their own aspirations and address their challenges. We co-created a community-accessible asset mapping system that can be updated, utilized, and incorporated in refuges' decision-making procedure. Guided by participatory community building methodologies, we engage refugee participants throughout the whole process of designing, collecting, analyzing and using asset data, in order to maximize the effects of asset mapping and refugees' sense of community.

Using mixed methods, we found that refugees have the capacities in collecting interesting asset data and potential for them to incorporate asset data in solving problems. However, there remains work to be done in engaging refugees in analyzing the asset data to improve their communities. The process of community asset mapping and social co-production of the data assets promotes social interaction between community members, awareness of community assets amongst community members, and self-efficacy in community problem solving. These all contribute to stronger communities.

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