

*Bustamante Duarte, AM.; Degbelo, A.; Kray, C. (2018): Exploring Forced Migrants (Re)settlement & the Role of Digital Services. In: Proceedings of 16th European Conference on Computer-Supported Cooperative Work - Exploratory Papers, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2018\_7*

# Exploring Forced Migrants (Re)settlement & the Role of Digital Services

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**Abstract.** In recent years, large numbers of forced migrants have arrived in urban areas all around the world. Access to relevant information and suitable technology can help forced migrants, mainly refugees and asylum seekers, to cope with several of the challenges they face in this process. We conducted a qualitative study with ten forced migrants and six social workers and a staff member of a collective lodging for young forced migrants in Münster, Germany. The goal was to identify challenges and needs in this specific context, find criteria for assessing digital support services for forced migrants, and suggest general aspects of improvement. We analyzed 36 existing mobile applications and web services useful for forced migrants upon arrival and during (re)settlement. Our results highlight some critical issues to be addressed through digital services for forced migrants regarding information reliability, timeliness, and complexity, as well as an occasional lack of experience with geospatial services.

## Introduction

Forced migration is a global phenomenon: around 65.6 million people in this situation were registered in 2016 (UNHCR, 2016). Germany, for example, registered 722.370 asylum applications for the same year (BAMF, 2017). Consequently, there is a need for a better understanding of this phenomenon and for strategies and (technology-related) tools to support forced migrants.

Forced migrants face distinct migration phases and information landscapes while going through diverse stages of awareness (Kennan et al., 2011). In this process, forced migrants show high levels of resilience and their strong collaboration and support dynamics (Fisher et al., 2013; Marlowe, 2010). Nonetheless, they also encounter several challenges such as social isolation (Almohamed, 2016; Andrade and Doolin, 2016), information poverty (Caidi et al., 2010), cultural barriers, limited proficiency in the local language (Brown and Grinter, 2016), lack of trust (Almohamed and Vyas, 2016), as well as limited access to services and health care (Talhok et al., 2016a,b). Various technological solutions have been developed to help forced migrants tackle these challenges e.g., (Brown and Grinter, 2016; Talhok et al., 2017; Shankar et al., 2016; Xu and Maitland, 2016).

Despite prior findings regarding challenges and needs of forced migrants, further work is needed due to the heterogeneity of the group, and the large number of factors influencing their situation. In this paper, we contribute to research with forced migrants in two ways: (i) we gathered their challenges and needs upon arrival and during (re)settlement in Münster, Germany; (ii) we used these findings to conduct an exploratory analysis of 36 services designed for, or useful to forced migrants. This analysis identified strategies used by these digital services to address the challenges from forced migrants, as well as their current gaps. Our results can benefit forced migrants and all relevant actors as they work towards solutions aimed at helping forced migrants upon arrival, and during the first stages of the (re)settlement process.

## Related work

As stated previously, forced migrants go through diverse information stages during their displacement. Kennan et al. (2011) suggested three stages (*transitioning*, *settling in*, and *being settled*) which are defined as "cyclical and iterative". The *transitioning* phase occurs prior to forced migrants' arrival to their host country. In this stage they are "seeking" and receiving information about their host country. In the *settling-in* stage, forced migrants are "oriented" and no longer limited to the information that is being provided to them but they actively extend it in scope and sources. Finally, in the *being settled* phase forced migrants have a clearer understanding of the information landscape while "constructing an internal map" about it and sharing this information with others.

Technology, as stated by previous work, facilitate a sustainable integration of refugees in their new place. AbuJarour and Krasnova (2017) observed that technology can enable numerous capabilities for Syrian refugees in Germany: social connectivity, effective telecommunication, safety and emergency services, mobility, translation services, the participation in an information society and in educational programs, the communication with the government, crowdsourcing, as well as maintaining refugees' cultural identity. Moreover, based on their experience with the Come\_IN initiative in Germany, Weibert and Wulf (2010)

concluded that computer technology is apt to promote both sustainable structural and cultural integration. The authors also suggested that a computer-based project can serve to establish and strengthen intercultural relationships in a neighborhood. Further work into the adaptation of the Come\_IN approach to a refugee camp in the West Bank shows that computer clubs can promote mutual learning between children refugees and student volunteers (Yerousis et al., 2015; Aal et al., 2014). Children refugees may extend their perspective over the boundaries of the refugee camp while acquiring new skills and contacts; and student volunteers gain a better understanding of the needs and struggles of the camp inhabitants. Lastly, Bustamante Duarte et al. (2018) conducted workshops with young forced migrants and young locals in Münster, Germany in order to codesign a mobile tool to support the former upon arrival and first stages of (re)settlement. Their study pointed out that the combination of participatory design and participatory research strategies is useful for engaging and building trust with young forced migrants while designing digital services for them.

Moreover, technology can also be helpful for forced migrants during their daily life activities in their new environment. For example, Baranoff et al. (2015) proposed a mobile service, *Lantern*, which helps refugees to navigate and learn about their new environment obtaining context-specific help using Near Field Communication (NFC) technology. Brown and Grinter (2016) mentioned several benefits of *Rivrtran*, a tool to facilitate engagement between refugees and their mentors (i.e., American families) during the (re)settlement process. The tool helped forced migrants to articulate their needs better, jointly formulate goals with their mentors, and initiate communication. Schreieck et al. (2017) developed *Integreat*, a mobile app which aims to provide local information for forced migrants in several cities in Germany. In their work, they derived a series of design principles for applications which aim to transmit information to a culturally diverse audience. Also, Ngan et al. (2016) developed *Moin*, a mobile app to support informal language learning and integration of young refugees in Bremen, Germany. In a more general perspective, Harney (2013) pointed out that mobile phones offer the possibility of mobilizing personal networks and aid forced migrants reducing the fears and uncertainties they have about their new place of (re)settlement. Gifford and Wilding (2013) indicate that technology offers new possibilities of imagining social horizons beyond the constraints of their settlement context to young people with refugee backgrounds. Phillips (2013) examined the impact of remote telephone interpreting in the (re)settlement experience of refugees. The author argued that despite the widespread view that on-site interpreters are always preferable to remote interpreters, refugees may be better served by telephone interpreters. Telephone interpreting services offer two benefits for forced migrants: recognition of their individual needs by the polity, and the safe negotiation of identity through the (re)settlement process. Moreover, Hashemi et al. (2017) analyzed mobile apps for language training and information provision regarding the host society in Sweden through the Technological, Pedagogical, Linguistic and Cultural model (TPLC-model). Their results evidenced that mobile

digital services related to translation and language training are common but not apps regarding societal information for the Swedish case.

Despite the key role technology can play easing the lives of forced migrants, it can also cause further difficulties. For instance, Schmitt et al. (2016) examined the technical technology infrastructure of the Za'atari refugee camp. Some issues were identified such as the uneven spatial distribution of signal coverage and carrier congestion which affect the life of the refugees in the camp. According to Wilding and Gifford (2013), technology can make it easier for others to make demands from distance potentially straining social relationships between forced migrants, and the kin at their home country. As this section illustrated, technology plays an important role in the lives of forced migrants. Understanding challenges and needs of forced migrants (both contextual, and universal), and key gaps of services designed for them is therefore important for the development of applications which effectively support forced migrants at different stages of the migration process.

## Approach and methodology

This work aims to 1) identify challenges and needs of forced migrants in Münster, Germany; 2) explore strategies to assess how digital services are addressing these; and 3) define initial aspects for improvement in these services. To achieve this, we applied a three-step method. First, we carried out a qualitative study with forced migrants and actors involved in their process of (re)settlement. Second, we used the outcome of the first study to derive criteria for an exploratory systematic analysis of existing services aimed at supporting forced migrants in Münster.

### Interview study with forced migrants and other relevant actors

#### Context

We conducted a series of interviews between January and November 2016 with forced migrants (N=10), social workers (N=6) and a collective lodging support staff member in Münster. We wanted to identify the needs, challenges and information communication strategies of forced migrants during their initial stages of (re)settlement in Münster. In 2016, Münster registered 2412 asylum seekers. In 2017, 942 refugees were officially registered.

#### Participants

For this first study, we recruited participants from two groups: 1) forced migrants in Münster (four individual interviews and two on-site group interviews), and 2) social workers and lodging support staff members (four individual interviews and one on-site group interview). Forced migrants in this article refer to both refugees and asylum seekers. We used snowball sampling to recruit participants from both groups. Ten forced migrants (two females and eight males, aged between 19 and

46 years old) participated in the interviews. Eight participants were from Syria, while two were from Albania and Eritrea. All participants had completed high school education. Four participants had achieved university degrees or were pursuing university education before fleeing their country. At the time of the interview, participants had been in Münster between 7 and 17 months. The six social workers and the support staff member worked in two different types of residences for forced migrants: 1) collective short-term shelters (N=2), and 2) collective lodgings where forced migrants stay until their asylum claim response arrives (N=5).

### Materials and Procedure

The interviews were semi-structured and included questions related to the forced migrants' life in Münster: their challenges, needs, means for searching and accessing information and services in the host city, along with their education and technology background. The interviews lasted between 25 and 50 minutes. All interviews were conducted in English. One of the two group interview sessions with forced migrants was assembled organically on-site. Some participants brought other forced migrants living in the lodging to attend or translate to other languages.

### Analysis

We used MAXQDA for the analysis of the collected qualitative data in three iterative cycles. We particularly focused on finding patterns related to forced migrants' access and use of information for the *transitioning* and *settling-in* stages (Kennan et al., 2011). We followed a descriptive coding method (Saldaña, 2009) for the first and second iteration, which resulted in inductive (emerging) and deductive (a priori) categories (Flick et al., 2004). The deductive categories were based on the results of previous research on forced migrants and their information technologies and communication landscapes, i.e., (AbuJarour and Krasnova, 2017; Talhouk et al., 2016b; Brown and Grinter, 2016; Andrade and Doolin, 2016; Kutscher and Kreß, 2016; Baranoff et al., 2015; Lloyd et al., 2013; Kennan et al., 2011; Caidi et al., 2010; Caidi and Allard, 2005). We defined seven categories (language, information, functional literacy, technology experience, forced migrants ask for..., information communication preferences, and information sharing) for the codes, which we clustered into three main themes: *challenges*, *needs*, and *strategies for information sharing during the (re)settlement*. A validation of the adjusted coding scheme (after the first iteration) was carried out by all authors.

The first theme *challenges* subsumes information related to difficulties forced migrants faced when performing certain tasks during their (re)settlement process. Its general categories were classified as *a priori* and confirmed by the data obtained from the interviews. These include challenges related to language (Brown and Grinter, 2016; Andrade and Doolin, 2016; Lloyd et al., 2013; Kennan et al., 2011; Danso, 2002), functional literacy (Brown and Grinter, 2016; Kennan et al.,

2011; Lloyd et al., 2013; Caidi and Allard, 2005), information access and understanding (Lloyd et al., 2013; Caidi et al., 2010; Kennan et al., 2011; Caidi and Allard, 2005; Baranoff et al., 2015) and limited prior experience using technology (Talhouk et al., 2016b; Baranoff et al., 2015; Gillespie et al., 2016; Lloyd et al., 2013; Kennan et al., 2011). Several subcategories emerged organically from the results of the interviews such as use of geospatial services, type of information visualization, and timeliness information.

The second theme *needs* was based on the main elements (resources, strategies, tools) forced migrants in the study mentioned as relevant to them when (re)settling in Münster. These aspects consisted of two categories. First, we found *forced migrants needs* which refers to aspects they require to have a better and more effective process of arrival and (re)settlement. The codes *learning local language*, *accessing formal education*, *offline services*, and *social interaction with local community* assigned to this category were defined deductively from prior research (Andrade and Doolin, 2016; Bin Morshed et al., 2017; Kutscher and Kreß, 2016; Caidi et al., 2010; Danso, 2002; Donnelly, 2000). Additional codes such as *having translators at the beginning*, and *other services*, emerged from the interviews. Second, it is the *information communication preferences* category which aimed to identify resources forced migrants found useful for communicating information to them through technology.

The third theme *strategies for information sharing during (re)settlement* pointed to the preferred (information) communication strategies – physical or digital – that forced migrants (FMs) have during the *transitioning* and *settling-in* phases. Four categories relate to communication processes for guidance: 1) FM with FM, 2) FM with the local community, 3) FM with support staff (e.g., social workers), and 4) FM decides not to ask others for guidance. These codes emerged from the interviews.

## Survey study of existing systems supporting forced migrants

### Context

The main research question of this second study was "how do existing mobile services address the challenges and needs identified by forced migrants during the interviews?". Previous work (e.g., (AbuJarour and Krasnova, 2017; Schrieck et al., 2017; Andrade and Doolin, 2016; Gillespie et al., 2016; Kutscher and Kreß, 2016; Rohde et al., 2016; Xu and Maitland, 2016)) has pointed out that mobile phones, particularly smartphones, are one of the main sources for forced migrants to access, manage and communicate information. Former studies have done specific evaluations of single services created for forced migrants (e.g., *Integreat*, *Moin*). However, there has been few, if any, broader systematic assessments for this group of services considering forced migrants' challenges and needs. Our research team analyzed 25 mobile applications and 11 web platforms used by or potentially useful for forced migrants during their migration processes.

## Procedure

We selected services following a two-step approach. First, we collected all services mentioned at least twice by different participants in a list containing thirteen services as result. Second, we included services available on the web portal *Apps for Refugees* (<http://www.appsforrefugees.com>, accessed in March 27, 2017) which compiles services (23 mobile applications and nine web platforms) potentially useful for forced migrants. The final list contained 36 services (25 mobile applications and 11 web platforms). Since six services were dysfunctional - three web platforms (i.e., Refugeemap.com, LaGeSoNUM, and Hilfebuchen.de) and three mobile applications (i.e., helphelp2, Wülfrath hilft 2 and Hope for Austria), we only analyzed the remaining 30 services.

## Analysis

We assessed the 30 services based on the results from the interviews. From it, we generated the following classification and evaluated how the selected services tackled: 1) "Limited Proficiency on Local Language", 2) "Internet Access", 3) "Information Complexity and Reliability", 4) "Prior Experience of Forced Migrants with Technology", 5) "Functional Literacy", and 6) "Strategies for Information Sharing".

# Findings

## Challenges and needs of forced migrants

### Limited Proficiency in the Local Language

All forced migrants highlighted, as expected, language as a core challenge. Several participants related it to feelings of fear, uncertainty, and stress during their everyday interactions with the host community (e.g., doctor's appointments, grocery shopping). Based on the collected narratives, this phenomenon does not only affect their individual communication with locals but also their access to services. For example, FM\_P6 stated

"I was afraid of going to LIDL because I say, if they ask me something I don't know the language and [then] what [can I] say to them?"

Such experiences can potentially have a negative impact on forced migrants' awareness of the procedures from which they are part of. FM\_P1 narrated about going to the doctor with her friend:

"[...] after three times [of going there] she knows the doctors need this [...] but when they speak [to] her she cannot understand."

Additionally, having limited knowledge of the local language can be perceived by forced migrants as a loss of social status. FM\_P4 stated about another resident at his collective accommodation:

“[...] he was very powerful in Syria [...] but he comes [here] and he cannot [even] say “I want some food”.

The assessment of digital services showed that these mainly address this challenge through:

- Education services to learn the German language: Two mobile applications promote language learning in a structured way. *Phase6 Hallo Deutsch Kinder* has as main goal language learning, while *Ankommen* aims to provide relevant but general information to guide refugees in their host country. It also provides material for German language learning.
- Tools to perform translation of phrases: Four (4/30) services offered either real-time translation (*Google Translate*) or pre-translated sentences to be used in different situations (*Refugee Phrasebook*, *Refugee Phrasebook -Interactive-*, and *RefuChat*). One (1/30) service connected translators with forced migrants searching for this type of assistance (*Alles Klar*).

Forced migrants also considered translation of information into their native languages as crucial during their first months. FM\_P1 mentioned,

"It is hard for [some of us the ones that] do not speak English because it is not Arabic copy for it."

In addition, the results from the survey study showed eight services (8/30) had their user interface (UI) and content in one language only (seven had only English and one only German as primary language). 21 services (21/30) had multilingual features. The languages most frequently used (which were not excluding among them) were English (26 services), Arabic (19 services), and German (17 services). 13 of these services (13/21) offered multilingual features in both UI and content. Four services (4/21) translated the content into several languages while the UI was displayed in a standard language (generally English). One service (1/21) translated only the UI components. One service (1/30) could not be fully accessed for this assessment.

### Limited Internet Access

Limited internet access was a central subject for some participants (three forced migrants, and one social worker). It is a matter which also has emerged in previous research in HCI4D (Dell and Kumar, 2016) and ICT4D (Bin Morshed et al., 2017). FM\_P7, for example, commented "*Without Internet, I [can't] use them*" when talking about translators and language learning services he wanted to resort to upon arrival. Limited internet connectivity can have a direct impact on the willingness of newly arrived forced migrants to explore their new host territory. In this sense, FM\_P6 stated:

"And, in camp we [didn't have] Internet there and we [were] afraid because if we [get] lost how to come back?".

The participant also added when asked about the characteristics of a useful mobile application for forced migrants,

“should be with Internet but it [has to be] useful when we don't have Internet [too] [...]because not everybody can have Internet in their phone.”

The analysis of the 30 services indicated that only thirteen supported offline use (to some extent). Seven showed some limitations when being accessed offline (see Figure 1). For example, one (*InfoAid*) required to download the daily reports (main content) beforehand for the app to operate with up-to-date information. One service (*Helping Hand*) had its content and its search services fully functional in offline mode. However, the map visualization section offered by the service was only accessible online. *Integreat* works offline but, at the time the study was conducted, few images did not load while using this mode. *Informationen für Flüchtlinge* had the option to download .pdf files while being online for later consultation in offline mode. *Ankommen* has almost all of its functionality available online, but the audiovisual resources for the language learning component had to be downloaded online prior its use in offline mode. As for the two navigation services (*osmAND* and *Google Maps*), they required downloading the area for which the map is needed prior to the offline use of the applications.

### Information Complexity

Eight participants (three forced migrants/five social workers) highlighted information complexity as another significant challenge. Two factors need to be considered when presenting information to forced migrants in Münster, a) *information overload* (see (Lloyd et al., 2013; Kennan et al., 2011)), and b) the *type of information's visualization*. Concerning the first factor, SW\_P4 expressed

"I think at the beginning for the people it is so many information, and it is very tiring that are so many things"

The results from the interviews, suggest that the present issue affects mainly *compliance information* which relates to regulations, policies, and procedures of the host country (Lloyd et al., 2013). Regarding this, FM\_P2 highlighted,

"I can speak German but I find [difficult to] to translate official papers."

About the second factor, *type of information's visualization*, one clear example from the interviews focused on geospatial information. FM\_P1 alluded to it, while referring to the city's buses routes maps,

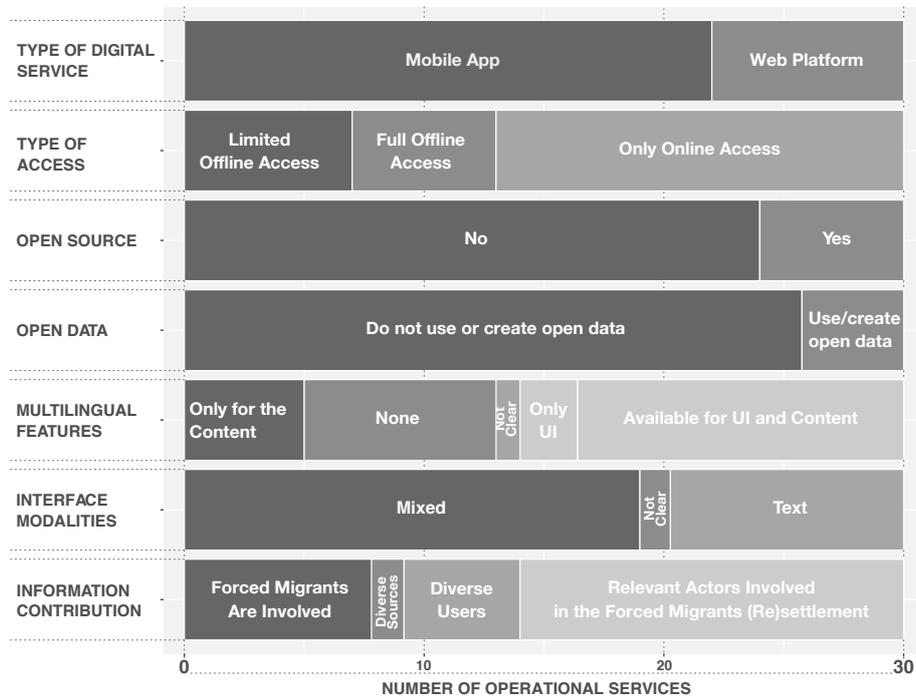


Figure 1. Overview of Main Results of the Survey Study on Operational Existing Systems.

"I cannot understand it, because is green, and blue and pfff... it makes you [feel] terrified."

Overall, both groups of interviewees expressed that it was not always clear to forced migrants how to effectively search for places that address their needs, how to get there, and how to ensure they will actually arrive at the right place. SW\_P7 indicated,

"if you have people that is new here in Münster, they ask you everything, where is the doctor? where is the Sozialamt? [...] where can I buy that? which bus I have to take to go there?".

Regarding information communication modalities, all surveyed services used text resources (to some extent). We classified services as entirely text-based when the primary, and sometimes sole, mean for information communication was text. 10/30 assessed services fit in this category. The remaining 19 services used a variety of resources and combinations to help forced migrants overcome information complexity. From these, text (from keywords to paragraphs) was combined with: icons (3/19); audio (2/19); images and icons (5/19); audiovisual (1/19); audiovisual and icons (1/19); audiovisual, images, and icons (2/19); images, icons and audio (1/19); maps (1/19); maps and images (1/19); maps and icons (1/19), as well as maps, icons and images (1/19). Among these 19 services, seven had non-text-based resources as their primary mean for information communication using a limited amount text. One service could not be fully

analyzed in this study since the registration process did not work during our testing. Though it is unclear which of these ways of conveying information most effectively help forced migrants to deal with information complexity, our results illustrate the diversity of strategies used by existing services when communicating information to forced migrants.

### Information Reliability and Timeliness

Two concerns were raised by five participants during the study regarding the trustability and timeliness of the information available. Regarding the first concern, the narratives from three forced migrants hinted at misinformation and misconception occasionally present among the forced migrants. One of them, FM\_P4 said,

"it was a common talk between the refugee[s] that [if] you tell the bus driver you are a refugee he will let you [in], that it is ok."

Another example was given by a social worker who said about forced migrants with babies that,

"at the beginning, they need[ed] to go every week to the doctor and they didn't go to, because they thought they need[ed] to pay [...]"

The availability of up-to-date information was reported by two social workers interviewed. For instance, SW\_P4 and SW\_P5 stated during a group interview,

"it would be very important that the information that are on these pages [websites] [is] updated because, for example, we got always [...] a list and we call[ed], and everything was already full, or it was old, so I think this can be very frustrating if you have this platform and everything is out [of] date."

We can thus conclude that frequent and timely updates of available information seem to be important to effectively address the needs of forced migrants in Münster. The analyzed services had some features towards addressing these two concerns. Regarding reliability, several services provide detailed information about topics which otherwise could be subject to inaccurate assumptions. For example, FM\_P4, who was formerly quoted on the myth about the bus tickets stated,

"The Ankommen app was telling us this is forbidden this is ok, this doesn't matter, [or] this might [bring] some problems for you. "

Also, some services provide details on the creators and contributors of the information they provide, promoting thereby the service's transparency along with the users' awareness about the information's source. The study identified seven services that clearly indicated forced migrants' involvement. In eight (8/30)

services (*Alles Klar*, *Welcome-Münster*, *Refuchat*, *Refoodge*, *Refugees-Welcome.net*, and *Refunite*) forced migrants partially contributed to their content. One more service (*Refugee Center Online*) had a combined approach where joined official inter-institutional data had a crowdsourced data curation process carried out by migrants (particularly refugees). As for *Integreat*, the creators did a survey among refugees to gathered requirements which they used to design the mobile application.

Collaborative strategies for the data creation of some services might enhance the potential for timely information. The larger the number of contributors from the group of interest or related actors, the greater the possibilities of having new and relevant information. Four services (4/30) were, distinctly, built on open data. Open data represents a way to promote collaboration between actors since it allows to jointly work upon, verify, and improve the data. From these, one (*Refugees Phrasebook* web-platform) created its own data and chose an open format through a CCO license, while three mobile services (*osmAND*, *Refugees Phrasebook-Interactive-* and *InfoAid*) draw upon data created in other platforms (*Open Street Map* and *Refugees Phrasebook* respectively) to build their services. The stand of the remaining 26 services regarding open data creation or use was not clear from their available documentation.

### Limited Experience of Forced Migrants with Geospatial Services

Three forced migrants reported also having some difficulties using geospatial services. FM\_P1 indicated

“Google Earth [referring to Google Maps] I did not use it before. I did not need it before. In my land [country], I know everything. It is a small land; you do not get lost easily. Here you get lost easily.”

Also, FM\_P7 expressed when asked about how he found places in the city

“I [search] in Google Maps, but it is not reality. [...] Maybe it is that I am not sure how to use it, so I like information from people.”

Furthermore, three forced migrants mentioned learning how to use these services at diverse stages of their migration; part of them did this after fleeing from their country. FM\_P2, who acted as FM\_P3’s interpreter during the interview, commented about FM\_P3’s use of Google Maps

“[At] the beginning, he did not know how to use it, but he came with other people they helped him [...]”

Despite this difficulty, mobile geospatial services seemed to be highly useful for forced migrants. About it, FM\_P6 when narrating how she and her husband move around:

“But, just with Google Maps, it helps us a lot. [...] We don’t know how to go there besides Google Maps.”

While the feedback overall was positive, some also highlighted shortcomings:

"Sometimes in Google Maps are not all the places where we want to go"

### Difficulties Due to Limited Functional Literacy

Reading and writing in German as well as in the forced migrants’ mother tongues are skills that become essential for their everyday lives in Münster. Functional literacy was referred to by four social workers during the interviews. SW\_P3, indicated that in several collective lodgings forced migrants are receiving "Alphabetisierungskurs" where they can "*go and learn from scratch*". Additionally, SW\_P2 stated that it is of high relevance for city institutions "*make sure [everything] is in every language*" when providing information to forced migrants. However, the participant also said,

"when people [don’t] know how to read or write [in] their own language, then we have a problem again."

Few forced migrants in Münster have limited functional literacy and classes in the collective accommodation as well as in schools are organized to support them in this matter. Nonetheless, according to the narratives of the social workers interviewed, at the beginning they have difficulties accessing information and learning the local language due to it. Concerning the analyzed services, many did not directly state a goal of creating a service which could be used by users with limited functional literacy except two services (2/30) (*InfoCompassBerlin* and *Refugees Center Online*). Both have as part of their mission to convey information to larger audiences irrespective of their educational background.

### Strategies for Information Sharing in the (Re)Settlement

Four main types of strategies for guidance across the new information landscape (Kennan’s *transitioning* and *settling-in*) were suggested during the interviews with forced migrants: 1) from other forced migrants (FM-FM), 2) from local community and volunteers (FM-Local Community), 3) from members of official institutions (FM-Official Institutions), and 4) those who do not ask for guidance, but rely only on the information they gathered.

The first type of collaboration strategy (FM-FM) was the most commonly highlighted by participants (five forced migrants/four social workers). The similarity in the cultural and social background and the presence of a common language hinted at a solid foundation for asking first others in the same situation. For instance, FM\_P1 recounted when we asked about how she found her way to supermarkets and shops in the first months "*We go sometimes by bus and we learn*

*each other.*" Likewise, FM\_P2 stated (when asked about how the exploration of the city was done during the first days),

"the people moves in groups, not one man, or two [...]they move in groups so the groups lead the other people, Google is used in case of an emergency or something if someone is lost they can find their way back."

The second guidance strategy (FM-local community) was reported by several participants (six forced migrants/five social workers). Forced migrants valued the various efforts done by the local community and volunteers (e.g., students' initiatives) to support them and welcome them in the new community. Such interactions were strengthened through the use of online platforms and groups in social media. For example, FM\_P5, P8, P9 and P10, during the group interview highlighted their use of

"the *Welcome Münster* service a lot since people helps you there [...] Germans organize parties, we see it, and we go there."

FM\_P2, acting as an interpreter during the group interview, mentioned about FM\_P3's experience,

"German people can understand English, his friend speaks a bit English [and] German people wanted to help."

Using this information sharing and collaboration strategy seems to promote social relationships between forced migrants and members of their host community. It can also guide forced migrants while navigating the new information landscape as well as the culture of the host community. As an illustration, FM\_P4 commented

"me and my brother [...] we found some nice Germans [who] spoke English, and they helped us a lot translating [...] guiding us; they helped my brother to get his flat."

Regarding the third information sharing strategy (FM-Official Institutions), four forced migrants recognized social workers in Münster as great facilitators and intermediaries to access information. FM\_P6, for example, said

"[...]social workers [...] are great, they discuss with us, they make all the things."

Moreover, participants (two forced migrants/two social workers) also recognized the help of well-established civil institutions such as "*the GGUA. [...], and AFAQ*"<sup>1</sup>(FM\_P5, P8, P9, and P10).

<sup>1</sup> The *Gemeinnützige Gesellschaft zur Unterstützung Asylsuchender e.V.* (GGUA) is a registered association which supports asylum seekers, refugees and migrants in Münster by offering them social and legal advice (see <http://www.ggua.de>). The *Verein für Kulturelle und Gesellschaftliche Zusammenarbeit* (AFAQ e.V.) is an organization which promotes intercultural and social cooperation in Münster (see <http://afaq-verein.de/?lang=en>; last accessed: April 18, 2018).

Lastly, two forced migrants indicated they preferred not to ask for guidance. About it, FM\_P6 stated (following a previous question where she raised concerns of asking locals)

" I don't like it, because if I ask for something and they don't give me help, then I'll feel bad."

11 services (11/30) promoted actions which involved active communication processes between forced migrants and other relevant actors. Five of these services (5/11) actively encourage bidirectional information sharing between forced migrants and the local community (FM-Local Community). Specifically, *Refugees-Welcome.net* encourages locals to offer housing options to refugees and asylum seekers. *Refoodge*, promotes dinners between forced migrants and locals. *Welcome-Muenster.org* organizes social events (parties, city tours, sports events) for both groups. *Alles Klar* connects forced migrants with local translators in their cities of arrival. Finally, *Refuchat* has ready-sentences and a chat to ease communication between volunteers, paramedics, and forced migrants. Regarding, the *FM-FM* strategy, this is largely neglected by such services. Furthermore, the *FM-Official Institutions* strategy seems to be handled in several services through an unidirectional top-down method of information communication towards forced migrants. In those, official institutions work as providers of information for them but do not count in their services with active features for forced migrants to constantly communicate with them (e.g., chats, posts) or to adapt the services.

## Discussion

Two studies were presented in this article. One identified challenges and needs of forced migrants in Münster, Germany via a series of interviews; the other one shed some light on strategies of existing platforms to address (some of) the identified challenges. The discussion in this section revolves around three aspects: new (or emerging) challenges from our data, major gaps in current services, and major implications of our results for research on collaborative technologies for forced migrants.

### Emerging challenges from the interviews

Challenges related to language, functional literacy, information access and understanding, as well as limited experience using technology were mentioned in previous work and also voiced by the participants. In addition, the interviews have highlighted issues not so often documented in previous studies. In particular, they reported challenges coping with existing geospatial information, along with limited experience with geospatial services in general. This is important given that geospatial information and services are the basis for navigating, as well as

developing cognitive collages and spatial mental models of the new environment<sup>2</sup>. One participant referred to the diversity of colors and routes were at time confusing. One doubted that the information provided by existing geospatial services (e.g., Google Maps) reflected reality. Participants' feedback may be the result of many factors (notably information overload). Still, they remind that Shneiderman (2000)'s vision of universal usability is yet to be achieved for geospatial information.

### Key gaps of current services

The majority of the services which were developed for forced migrants seemed to be focused on the Arabic speaker group which move to English or German-speaking countries. Thus, other groups of forced migrants from countries such as Somalia, Eritrea, Albania, and Afghanistan, who are also arriving in Münster are mostly not covered by these technologies. Additionally, forced migrants mentioned reduced internet availability as a core impediment for information access during the interviews. Currently, approximately one-third of all mobiles services analyzed address this issue (out of which half were having difficulties providing fully operational services in offline mode). This calls for more work producing tools supporting offline usage, to better cope with the conditions of forced migrants' life.

### Implications for research on collaborative technologies for forced migrants

The analysis highlighted three key information sharing strategies: among forced migrants; between forced migrants and the local community; and between forced migrants and official institutions (via social workers as prime intermediaries). One third of the services did provide some features which can support multi-directional information exchange between the different parties. It is an interesting research question to explore how tools which support all three information sharing strategies could be designed. Further assessing the impact of these services on forced migrants life (e.g., via ethnographic studies) would be valuable for our understanding of CSCW-related systems in non-work settings.

Several forced migrants reported difficulties while using geospatial information or services. Despite not being widely supported by the studied digital services, the *FM-FM* strategy was used by forced migrants either to ask others for directions, to explore the city in groups, or teach each other how such geospatial services worked. Supporting this kind of collaboration into services and leveraging it during the design process, may lead to more effective tools that are better adapted

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<sup>2</sup> Cognitive collages and spatial mental models were presented in (Tversky, 1993) as two metaphors describing people's knowledge about their environment: the former refers to distorted, incomplete spatial knowledge, while the latter denotes coherent mental representations of spatial relations among landmarks.

to the needs and practices of forced migrants. Developing and incorporating more flexible and collaborative visualizations of the information (e.g., (Brodie, 2005; Isenberg et al., 2011)) and geovisualizations (e.g., (Fechner and Kray, 2014; MacEachren and Brewer, 2004; Nöllenburg, 2007)) also constitutes a promising line for future work. Similarly, adding location-based features to promote co-located information exchanges among forced migrants could help to address information complexity upon arrival by filtering information based on their current immediate context.

Moreover, the small number of services using open source data (3/30) was revealing. Since forced migration is a recurring phenomenon, the use of open data (and open source platforms) could be useful to capitalize on past experiences. At the moment, most of the services currently available do not have a clearly documented policy as regards the license of their data. Since data is copyrighted by default, re-use of this existing data can barely happen. Research on services for forced migrants may thus benefit from a more open approach towards data and service sharing.

## Limitations

The limited number of participants is one of the drawbacks of this exploratory study influenced by several factors. First, forced migrants in the initial phases of (re)settlement have a variety of daily activities which are a priority (e.g., doctor's appointments, asylum claim procedures). Hence, setting up fixed interviews was a complex task. Second, we specifically targeted forced migrants who spoke English. They often act as social and communication intermediaries in the lodgings being aware of issues several forced migrants are facing. Thus, most insights obtained were from participants who spoke English. Fewer responses were gathered from participants speaking German, Arabic, and Farsi, consequently under-representing the opinion of these groups of forced migrants.

Additionally, some challenges and needs (e.g., limited functional literacy, need for updated information) were obtained only from the interviews with social workers or staff members at the lodgings. Therefore, further explorations are needed to study these aspects from the forced migrants' perspective. Furthermore, only two sources were used to gather the surveyed digital services. Additional studies could include a larger sample, and assess the services directly through usability tests with the forced migrants. Finally, our study assessed mainly single-purpose mobile apps and web platforms and did not explore more general platforms which are also useful for information access and sharing among forced migrants (e.g., Facebook, Whatsapp, or Telegram). Analyzing these platforms would have provided a more complete picture of issues, and best practices of services used by forced migrants during their resettlement.

## Conclusion

Previous work has identified challenges and needs of forced migrants in countries such as Australia, Canada, New Zealand, and the United States. The work reported in this paper complements these by identifying challenges, needs and collaboration strategies of forced migrants (FM) in Münster, Germany. The participants mentioned challenges identified in other contexts such as language, functional literacy, information access and understanding. In addition, they reported issues not so often documented in previous studies such as difficulties coping with existing geospatial information and limited experience with geospatial services. Based on the above information, we assessed 25 mobile applications and 11 web platforms which can support forced migrants in their (re)settlement. Our analysis highlighted the need for exploring information visualization strategies which consider information overload. It also calls for tools which favor reliability and timeliness of the available information, and which promote the information sharing strategies of forced migrants identified (i.e., FM-FM, FM-Locals, and FM-Official Institutions). Further explorations on this matter would be valuable towards CSCW approaches for forced migrants during their (re)settlement. Finally, the analysis calls for more services that work offline, and a more open approach towards data sharing to enable the community to better capitalize on past experiences.

## Acknowledgments

The authors gratefully acknowledge funding from the European Union through the GEO-C project (H2020-MSCA-ITN-2014, Grant Agreement Number 642332, <http://www.geo-c.eu/>).

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