

PARTICIPATION & (RE)SETTLEMENT

Envisioning Mobile Services with Young Forced Migrants

Ana Maria Bustamante Duarte

UNIVERSITY OF MÜNSTER

DOCTORAL DISSERTATION

**Participation & (Re)Settlement: Envisioning
Mobile Services with Young Forced Migrants**

Inaugural dissertation in fulfillment of the academic degree of

Doctor of Natural Sciences (Dr. rer. nat.)

in the Department of Geosciences
of the Faculty of Mathematics and Natural Sciences
of the Westfälische Wilhelms-Universität Münster

Submitted by
Ana Maria Bustamante Duarte
from Bogota D.C., Colombia

- 2018 -

Dean: Prof. Dr. Harald Strauß

First supervisor: Prof. Dr.-Ing. Christian Kray (first reviewer)

Second supervisor: Prof. Dr. Michael Gould (second reviewer)

Third supervisor: Prof. Dr. Tiago Oliveira

Day of defence: _____

Day of promotion: _____

GEO-C

European Joint Doctorate in Geoinformatics: Enabling Open Cities
Marie Skłodowska-Curie Action (ITN-EJD)



Acknowledgements

It's now my pleasure to thank several people for their fantastic support, their advice, and their trust through all this process. I would like to thank, first and foremost, my supervisor Christian Kray for having his doors always open for conversations and discussions, for his advice, feedback, and constant support. I would also like to thank Auriol Degbelo, for having always been there, for his continuous guidance, for his dedication, the talks, and discussions. From both of them, I have learned so much during these years. I will carry with me their teachings for the rest of my life. Also, a special thanks to my second supervisor Michael Gould for his feedback during the three years of the Geo-C project.

I am especially grateful to my friends in Colombia, Sofi, Mafe, and Joha, as well as to the fantastic people I have met in Münster. To my friends, Mehrnaz, Samuel, Fer, Diego, Shivam, Guiying, Thore, Nina, Gabriele, Ralf, and Marion, it was the most beautiful surprise to have met them through this adventure. They made my days here an unforgettable experience. To my friends and colleagues in Geo-C, I am happy to have shared this experience with all of them. To Markus, Apurva, Lasse, Albert, Max, Karsten, and Heike, special thanks for their support and collaboration on this project. To all my wonderful colleagues in the Sitcom Lab, and to the incredible people at the Institute for Geoinformatics, to all of them, all my gratitude.

Additionally, I've had the pleasure to get to know and work, outside IfGI and the Geo-C, with several amazing people through this research (too many to be all listed here). I am incredibly thankful for their trust, their time, and their collaborations. Their experiences and conversations not only supported this research but also inspired me.

I would also like to thank my incredible family, my parents, Johaira and Oscar, and my partner in crime, Javi, I am grateful for their love, their understanding, and their unconditional support (gracias por todo el amor, la comprensión y por su apoyo incondicional. Significan el mundo entero para mí).



This dissertation is funded by the European Commission within the Marie Skłodowska-Curie Actions (ITN-EJD). Grant Agreement num. 642332 - GEO-C - H2020-MSCA-ITN-2014.

Abstract

In recent years, digital services have played a crucial role in the forced migration phenomenon worldwide. Researchers and practitioners in Human-Computer Interaction (HCI) and Information Science (IS) have explored the impact of digital solutions and proposed new approaches to tackle the specific conditions of forced migration. Nonetheless, several of the currently available digital services developed for this purpose have had limited participation of this group in their development process. Digital services could benefit from forced migrants' participation during their design and development process. It could enhance the services to address more effectively forcibly displaced communities' needs and challenges in the different phases of their involuntary displacement.

This thesis focuses on the role and adaptation of participatory design (PD) approaches to create “safe spaces” where young forced migrants can be co-researchers on and co-designers of mobile (geospatial) services to support them upon arrival and during the first stages of their (re)settlement in the host cities. In such particular context, the current research has three main contributions. First, it identified a set of initial challenges and needs of forced migrants upon arrival and in the first stages of their (re)settlement in Münster, North-Rhine Westphalia, Germany. Second, it proposed adaptations on PD's practices to effectively encourage young forced migrants' participation codesigning their digital services. Lastly, it developed two augmented geovisualizations prototypes to assist with their navigation of host cities in such situation. The proposed PD adaptations combined core concepts and strategies from participatory research (PR), didactics, and PD such as “safe spaces”, didactic reduction, reflective thinking, and workshops. The open-source prototypes are based on combinations of static and dynamic geospatial augmentations (images and augmented reality) which were combined with digital maps. These solutions were tailored based on the feedback from the forcibly displaced populations participating. Their main aim was to ease forced migrants arrival in host cities by supporting their spatial familiarization with unknown urban environments.

Overall, the contribution of this thesis advances on the generation of participatory approaches for forced migrants to design their digital services and technologies while supporting host cities in their processes towards generating more inclusive urban environments for all of its citizens.

Contents

1	Introduction	3
1.1	Motivation	3
1.1.1	Forced Migration and “Arrival”	3
1.1.2	Digital Technologies and Forced Migration	5
1.1.3	Participatory Design and Forced Migrants	6
1.2	Scope and Research Questions	7
1.2.1	Scope	7
1.2.2	Research Questions	8
1.3	Methods	9
1.3.1	Qualitative Methods	10
1.3.2	Quantitative Methods	12
1.4	Contributions	13
1.5	Thesis Outline	15
2	Exploring Forced Migrants (Re)settlement & the Role of Digital Services	19
2.1	Introduction	19
2.2	Related work	20
2.3	Approach and Methodology	22
2.3.1	Interview Study with Forced Migrants and Other Relevant Actors	22
2.3.2	Survey Study of Existing Systems Supporting Forced Migrants	25
2.4	Findings	26
2.4.1	Challenges and Needs of Forced Migrants	26
2.4.2	Strategies for Information Sharing in the (Re)Settlement . . .	32
2.5	Discussion	35
2.5.1	Emerging Challenges from the Interviews	35
2.5.2	Key Gaps of Current Services	35
2.5.3	Implications for Research on Collaborative Technologies for Forced Migrants	36
2.5.4	Limitations	37
2.6	Conclusion	37
3	Participatory Design and Participatory Research: an HCI case study with young forced migrants	39
3.1	Introduction	39

3.2	Related Work	41
3.2.1	Participatory Design	41
3.2.2	Participatory Research	46
3.2.3	Summary	52
3.3	Case Study	54
3.3.1	Forced migration	54
3.3.2	The Role of Technology and HCI in Forced Migration	55
3.3.3	Context and Refugee Situation in Münster, Germany	56
3.4	Methodological Considerations	58
3.4.1	Activities Conducted	58
3.4.2	Elements from Participatory Design	63
3.4.3	Elements from Participatory Research	67
3.4.4	Ethical Considerations	70
3.5	Results	71
3.5.1	Challenges of Participatory Design and Participatory Research	72
3.5.2	Opportunities of Participatory Design and Participatory Research	75
3.5.3	Limitations of the Case Study	78
3.6	Lessons Learned	80
3.6.1	Lessons Learned Regarding PD+PR Practices	80
3.6.2	Lessons Learned Regarding PD+PR Theory	85
3.7	Conclusions and Future Work	87
4	“Safe spaces” in Participatory Design with Young Forced Migrants	91
4.1	Introduction	91
4.2	Related Work	92
4.2.1	‘Safe spaces’ in Participatory HCI	92
4.2.2	‘Safe spaces’ in Educational Set-ups	93
4.2.3	Digital Technologies and Forced Migration	95
4.3	‘Safe spaces’: A Case Study	95
4.3.1	Context	95
4.3.2	Components to Enable ‘Safe Spaces’	96
4.4	Findings	102
4.4.1	Engagement	102
4.4.2	‘Comfortable’ Spaces and Trust Building	104
4.4.3	Constant Reflections of Facilitators	105
4.4.4	Aspects for Recalibration	105
4.5	Lessons Learnt	107
4.6	Conclusion	110
5	Discussion	111
5.1	Forced Migrants Context and Mobile Digital Technologies	111
5.2	PD+PR: A PD Adaptation with Young Forced Migrants	115

5.3	“Safe spaces” and Young Forced Migrants	117
5.4	Managing Ethical Issues in Participatory Processes with YFMs	118
5.5	Mobile Geospatial Services to Support Arrival	121
5.5.1	Technical Aspects of the Prototypes’ Development	123
5.6	Limitations and Generalizability	124
6	Conclusion and Outlook	127
	Bibliography	131

List of Figures

1.1	Overview of methods, contributions, and outline of this thesis	17
2.1	Overview of main results of the survey study on operational existing systems	28
3.1	Stage model of participation based on M. Wright et al. (2010) (also translated into English)	49
3.2	Components from PD and PR considered for our case study.	53
3.3	Demographics of the young forced migrants participants.	57
3.4	Overview of methods used in the case study with young forced migrants with limitations	62
3.5	Images of Workshop No. 3 – joint activity between young forced migrants and local students	65
3.6	Image of a paper-based wireframe created by one of the participants of the YFMs group	66
3.7	Ethical considerations with immigrant population based on Hernandez et al. (2013) and Nguyen et al. (2013)	71
4.1	Overview of ‘safe spaces’ characteristics in education and participatory HCI	94
4.2	Examples of material used in the workshops	97
4.3	Spatial Layout: Before (left) and Modified (right)	99
4.4	Participatory workshops (including group discussions, hands-on activities, privacy board, and paper prototypes)	104
4.5	Overview of ‘safe spaces’ concept: four enablers and three factors for measuring success.	108

List of Tables

0.1	List of publications part of this thesis.	1
-----	---	---

List of Abbreviations

API	Application Program Interface
AR	Augmented Reality
EU	European Union
FM	Forced Migrants
GPS	Global Positioning System
HCI	Human-Computer Interaction
HTML	HyperText Markup Language
IDP	Internally Displaced Population
ICT	Information and Communication Technology
IS	Information Science
JSON	JavaScript Object Notation
NGO	Non-Governmental Organization
NoSQL	Not Only Structured Query Language
NRW	North-Rhine Westfalia
LBS	Location-Based Service
OSM	OpenStreetMap
PAR	Participatory Action Research
PD	Participatory Design
PR	Participatory Research
QDA	Qualitative Data Analysis
SKA	Spatial Knowledge Acquisition
SDK	Software Development Kit
UI	User Interface
YFM	Young Forced Migrants

List of Publications

The present thesis is constituted by a accumulation of publications accepted and published, or under-review in several outlets. Chapter 2 corresponds to P2, Chapter 3 to P1, and Chapter 4 to P3. The complete list can be seen in Table 0.1 below.

No.	Publication Details	Outlet	Status
P1	Ana Maria Bustamante Duarte, Nina Brendel, Auriol Degbelo, and Christian Kray. 2018. “ <i>Participatory Design and Participatory Research: An HCI case study with young forced migrants.</i> ” ACM Transactions on Computer-Human Interaction 25 (1): 1–39. DOI: 3183791.3145472.	Journal	Published
P2	Ana Maria Bustamante Duarte, Auriol Degbelo, and Christian Kray. 2018. “ <i>Exploring Forced Migrants (Re)settlement & the Role of Digital Services.</i> ” 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.	Conference Proceedings	Published
P3	Ana Maria Bustamante Duarte, Mehrnaz Ataei, Nina Brendel, Auriol Degbelo, and Christian Kray. “ <i>Safe spaces</i> ” in <i>Participatory Design with Young Forced Migrants.</i> Submitted for review to: CoDesign.	Journal	Submitted

Tab. 0.1: List of publications part of this thesis.

Additionally to the publications above, the author of this thesis co-authored a feature article (Talhouk, Bustamante, et al., 2018) which reflected on experiences and insights of HCI researchers working on research projects with forced migrants. Some of the ideas there presented are briefly referred to on Chapter 5 Section 5.4 as part of this thesis discussion.

Introduction

“No one leaves home unless home is the mouth of a shark.”

— Warsan Shire

(in “Teaching My Mother How to Give Birth”)

This thesis provides the reader with insights on the topic of participation in codesign process of mobile digital services with (young) forced migrants in their *arrival* to host cities. This introductory chapter provides the reader with the general context and relations created through each of the research project’s steps and activities. First, it presents a detailed explanation of the motivation underlying this thesis in Section 1.1. It looks into forced migration and the role and potential impact of digital technologies and participatory approaches in this scenario. The goal is to explore ways within participatory Human-Computer Interaction (HCI) to support the (re)settlement of forcibly displaced communities, particularly their youth, in host cities. Afterward, it explains the scope and research questions of this research in Section 1.2. Following, the diverse methods and how they connect to answer a mostly qualitative-driven research approach is introduced in Section 1.3. The final part of this section wraps up with a detailed explanation of the contributions of the thesis in Section 1.4.

1.1 Motivation

1.1.1 Forced Migration and “Arrival”

According to the 2014 UN report, 2.5 billion additional people, will move to cities in the upcoming years (UN DESA, 2014). Forcibly displaced populations are part of such a global phenomenon. They are forced to leave their countries to escape persecution, conflict, repression, disasters related to natural or human-induced hazards, as well as environmental situations that endanger their lives, livelihoods, and freedom (IOM, 2011).

In 2017, UNHCR (2017c) reported 68.5 million forcibly displaced people worldwide due to “persecution, conflict, or generalized violence” of which 52% are under-aged. 25.4 million people were considered refugees, 40.0 million as internally displaced population (IDPs), and 3.1 million as asylum-seekers (UNHCR, 2017c). The 2017 statistics on forced displacement show an increment of 2.9 million people in this situation compared to the 65.6 million reported by the same organization in 2016 (UNHCR, 2017a). Moreover, by the end of 2017, forced migrants, refugees specifically, were hosted in their majority by Turkey, Pakistan, Uganda, Lebanon, Iran, Germany, Bangladesh, and Sudan (UNHCR, 2017c). Europe reported having hosted 2.6 million refugees while Turkey had 3.5 million. From Europe’s total count of refugees, Germany had received, by the end of 2017, 970,400 people in this situation while 198,300 asylum applications were recorded (UNHCR, 2017c). The official German Ministry for Migration and Refugees reported 198,317 asylum applications (BAMF, 2017).

The previous numbers show the large scale of the forced migration phenomenon and its relevance not only in Europe but worldwide. It calls for strategies that explore ways to support forcibly displaced people in their different stages (*pre-flight, flight, and arrival* (UNHCR, 1999)) of involuntary migration. In this search for safety, forced migrants are confronted with various adverse situations circumstances. For example, several forced migrants worldwide are arriving mainly to diverse urban-like settlements (e.g., mid/large-scale camps, or cities). Upon arrival and during the first stages of (re)settlement they are facing issues such as cultural shock, potential social isolation, and restricted access to health care, among others (AbuJarour and Krasnova, 2017; Slonim-nevo, 2015; Almohamed, 2016; Talhouk, Ishtiaque Ahmend, et al., 2015; Talhouk, Mesmar, et al., 2016). It is in such a context where a diversity of approaches, tools, and services are needed for supporting this particular community.

Moreover, in terms of their information landscape three phases, which are cyclical and iterative, are identified: *transitioning, settling in, and being settled* (Kennan et al., 2011). The process of moving and transitioning from their home-countries to an unfamiliar urban environment where they will settle can be challenging (Stein, 1981). Regarding the information landscape, forcibly displaced populations are confronted with a series of challenges which can impact their social inclusion (Andrade and Doolin, 2016). Social inclusion is a process where constraints of space are overcome in different moments in time to gain access to the informal social networks (ibid). Some of the challenges which can be face upon arrival and in the (re)settlement stage include information poverty (Lloyd et al., 2013), limited proficiency in the local language (Kennan et al., 2011; Caidi, Allard, and Quirke, 2010; Danso, 2002), inability to assess the quality of the information or their sources (Kennan et al., 2011),

as well as sometimes unavailable guidance in the local (institutional) context (Danso, 2002).

The previously mentioned aspects are some of the several situations forced migrants to encounter when arriving to host cities. The complexity (unfamiliarity or structure) of these information landscapes can hinder their full participation in their host or new communities (Lloyd et al., 2013). Several strategies can help in improving forced migrants capabilities to navigate their information landscapes in the host cities (Lloyd et al., 2013). The development of digital technologies and services can support and strengthen these capabilities (Andrade and Doolin, 2016). These can also ease their participation in the host communities in ways they find valuable (ibid). A better information landscape navigation and mapping have the potential to affect positively forced migrants' social inclusion in host cities Lloyd et al., 2013. Hence, all the above aspects have an impact on the urban agendas worldwide since most forced migrants are arriving and (re)settling in urban areas (Earle, 2016).

1.1.2 Digital Technologies and Forced Migration

One of the main “turning points” for the recent forced migration has been the extensive use of digital technologies, and in particular of smartphones (Gillespie, Osseiran, et al., 2018; Kaufmann, 2018; Kutscher and Kreß, 2016). Digital technologies and services have a great potential to ease (re)settlement of forcibly displaced population in several ways (Kaufmann, 2018; Brunwasser, 2015; Kutscher and Kreß, 2016; BenEzer and Zetter, 2014; Andrade and Doolin, 2016; Kennan et al., 2011). They can, for example, ease social connectivity (AbuJarour and Krasnova, 2017; Yerosis et al., 2015; Aal et al., 2014), favor communication by facilitating translation (D. Brown and Grinter, 2016), provide local information needed for daily life in the new city (Schreieck et al., 2017), and aid with language learning (Ngan et al., 2016; Hashemi et al., 2017). These technologies and services can also assist human mobility and navigation (Baranoff et al., 2015; AbuJarour and Krasnova, 2017), as well as support sustainable structural and cultural integration (Weibert and Wulf, 2010). Furthermore, they can help reduce fears and uncertainties during (re)settlement (Harney, 2013). Specifically, for young forced migrants, digital technologies offer the possibility to imagine new scenarios beyond the constraints of their (re)settlement context (S. M. Gifford and R. Wilding, 2013).

Many different types of digital (mobile) services have been created for forced migrants e.g., InfoAid, Refugees Phrase Book, Ankommen, Refugees-Welcome, Refugees Center Online, Google's Crisis Info Hub. Others were created for the general public, such as social media or navigation services, but have been frequently used by forced

migrants to address several of the situations they are confronted with during their involuntary displacements, e.g., Google Maps, WhatsApp, Facebook, and Google Translate (Kaufmann, 2018; AbuJarour and Krasnova, 2017). Moreover, further examples can be found in fields such as human-computer interaction (HCI) and information systems (IS). Mobile services such as Integrate (Schreieck et al., 2017), Lantern (Baranoff et al., 2015) or a human-in-the-loop translation tool for transient use (D. Brown and Grinter, 2016) have been developed to address, for example, information access and navigation upon arrival as well as to ease communication with locals for forced migrants. Nonetheless, the use and full potential of digital technologies and services is hindered by some factors (Irani et al., 2018; Kutscher and Kreß, 2018), and can present new drawbacks for forced migrants.

The use of digital technologies and services by forced migrants can be disrupted by the condition and availability of data and technical infrastructure. For example, uneven distribution of signal coverage for mobile phones affects the access to communication services in the Za'atari camp (Schmitt et al., 2016). Another example is the profound impact that restricted internet access has in Bangladesh (Bin Morshed et al., 2017). In a world moving towards digitalization, exploring and understanding how forced migrants use digital technologies and services and their needs regarding these, becomes essential. Addressing this matter not only supports forcibly displaced population during their (re)settlement (AbuJarour and Krasnova, 2017; Talhouk, Ishtiaque Ahmend, et al., 2015; Andrade and Doolin, 2016) in host cities. It could also contribute to the creation of inclusive and open digital cities. The advance in this agenda comes from practices where true equality in communities as co-decision makers occurs (Kaika, 2017). Thus, a more in-depth exploration and understanding of forced migration, (re)settlement and the role of digital technologies and services entails the direct and active participation of these communities in the process.

1.1.3 Participatory Design and Forced Migrants

As stated in the previous section, the participation of forced migrants' communities can have a positive impact on the process of development of digital technologies and services that support them. For example, the benefits of participatory HCI approaches with young forced migrants such as participatory design (PD) or participatory action research (PAR), have been documented by several researchers in the HCI field (Talhouk, Montague, et al., 2017; Fisher, Yefimova, and Peterson Bishop, 2016; Fisher and Yefimova, 2016; Yerousis et al., 2015; Aal et al., 2014; Fisher, Peterson Bishop, Magassa, et al., 2014; Fisher, Peterson Bishop, Fawcett, et al., 2013; Weibert and Wulf, 2010).

PD has a long tradition in HCI for designing systems which support users' actions (Greenbaum, 1991). It aims to build a proactive and mutually beneficial relationship between users and developers (Halskov and Brodersen, 2015). It is based on several principles which include a diversity of voices in the design process, democratic decision-making, mutual learning, effective knowledge acquisition, and iterative actions (Bødker, 2002; Greenbaum, 1991; Muller and Druin, 2012; Suchman, 2002; Kyng, 1996; Halskov and Brodersen, 2015). PD is particularly relevant when working with vulnerable or marginalized groups. It empowers misrepresented groups in design and development systems set-ups (Druin, 2002; Muller and Druin, 2012). For example, PD has been used frequently in HCI with elderly, children, homeless, young forced migrants. A more detailed discussion on this aspect can be found in chapters 3 and 4. Nonetheless, PD has major gaps which need to be addressed in future discussions (Vines, Clarke, Light, et al., 2015). Some of these refer to aspects such as what participation implicates, what are the researchers' roles on it, power balance, representation of participants voices in the design process, among others (ibid).

Aiming to generate some initial insights on Vines, Clarke, Light, et al. (2015) gaps in PD, the current thesis focuses on the role, uses, and adaptations of participatory design (PD) approaches when doing HCI research side-by-side with young forced migrants. Mainly, we gather insights into the researchers and participants' roles in these spaces and into the power balance of these by openly encouraging the creation of "safe spaces" through reflective processes. Such spaces are specifically planned to enable young forced migrants to become co-researchers and co-designers of mobile (geospatial) services to support them upon arrival and during the first stages of their (re)settlement in the host cities.

1.2 Scope and Research Questions

This subsection presents the scope and problem statement of this thesis and introduces the research questions guiding it.

1.2.1 Scope

Forced migration is a global phenomenon which has been a long part of the history of humanity. The work here presented aims to delve into the understanding of forced migrants' context and the role of mobile (geospatial) services to support them upon arrival and first stages (re)settlement in their host cities. Germany was selected as the location for the research. Particularly, the city of Münster in the North-Rhine Westphalia (NRW) federal state. Two main reasons influenced this decision.

First, since 2014, the year that marked the beginning of the so-called refugee crisis, Germany has been the country receiving the largest amount of refugees and asylum seekers within the European Union (EU). Second, Münster, NRW the location of the researchers' host institution. It is relevant to highlight that the federal state of NRW had received the largest percentage (26,90%) of asylum seekers arriving in Germany (BAMF, 2017) representing the 21,14% of the distribution scheme set-up for the country (Gemeinsame Wissenschaftskonferenz, 2018).

The research had as main participants two groups of forced migrants who had recently arrived or had been living for less than a year in Münster. The first group were forced migrants, between 22 to 46 years old, who were living in the temporary collective accommodations set-up for asylum seekers in the city. The second group were young forced migrants between 15 to 20 years old who were enrolled at a vocational high school in the city. Forced migrants from both groups had diverse countries of origin which included Syria, Afghanistan, Eritrea, Guinea, Iran, Iraq, Nepal, Somalia, Albania, and Nigeria. To have a better understanding on the forced migration local situation research activities were done in collaboration with other local relevant actors (young locals, a vocational high school, volunteers, and social workers, and staff members at the different temporary lodgings).

1.2.2 Research Questions

Based on the previously presented scope, this thesis specifically focuses *on the role of participatory approaches to support the design of mobile (geospatial) services with forced migrants for their arrival and first stages of their (re)settlement in Münster*. To address this, three main guiding questions were derived:

- **Q1: What are the challenges forced migrants face along with the needs they have upon arrival and during the first stages of their (re)settlement in their host cities? What is the role of mobile digital services on addressing these?**

This question aims to provide an understanding of the forcibly displaced populations' context (e.g., challenges, needs, expectations) in Münster, NRW. Its insights informed Q2 on the exploration of participatory approaches for designing (geospatial) technologies with these communities. Also, such an investigation entailed a further look into forced migrants' use of digital mobile services during the (re)settlement stage in the host city. The understanding of forced migrants' context in Münster and insights from their use of digital services can serve as a guide for forced migration' researchers and relevant actors in Münster, and potentially in Germany. Data on this question are

gathered through semi-structured interviews with forced migrants in their first stages of (re)settlement as well as social workers and supporting staff in the temporary collective lodgings where they were residing.

- **Q2: How can participatory design (PD) be adapted to design mobile (geospatial) services with young forced migrants?**

Digital mobile services used or designed for forced migrants' use require to directly and efficiently address their challenges and needs, as the ones identified in Q1. Hence, forcibly displaced communities need to be an active part of the ideation and design processes of these services. PD emerges, due to its inherent characteristics, as a promising approach to design mobile (geospatial) services with young forced migrants in this situation. Nonetheless, PD has not been, to the best of our knowledge, explored in HCI and Information Science (IS) extensively for this particular purpose. Input and recommendations on this specific question were collected through two large iterations of participatory workshops in distinctive years. These were done with young forced migrants, from diverse backgrounds, enrolled at a vocational high-school in the Münster. These workshops, counted occasionally, with the participation of young people from the host community.

1.3 Methods

The current section provides an overview of the methods used during this thesis. The approach here presented is based, mainly, on qualitative research methods occasionally combined with quantitative strategies to address the defined research questions. The selected methods and research approaches on this thesis for data collection and analysis are drawn from diverse fields such as HCI, as well as education and other social sciences. It is relevant to highlight that methods in HCI are varied and they are already drawn from diverse disciplines such as sociology, computer science, psychology, communication, among others Lazar et al. (2010, p .2). Qualitative methods are extensively used in research with vulnerable communities, e.g., children (Greene and Hogan, 2005) or migrants (Hernandez et al., 2013), due to their capabilities to conduct more in-depth and sensitive research in socially complex and delicate contexts.

Q1 has been answered mainly through results obtained from semi-structured interviews done with diverse forced migrants as well as some relevant actors (individual and group) and a systems survey for the digital mobile services available. Q2 was addressed using case studies (Lazar et al., 2010, p .147) as the overarching method. Lazar et al. (2010, p .147) mention that a case study allows examining

in more in-depth one or more particular situations with a small number of cases available. The author also states that case studies are mainly qualitative, but they can also count with quantitative methods to assess the situations in context. The case studies here presented followed these principles. They have a specific focus on participatory methods due to the angle of Q2 on PD. An overview of the qualitative as well as the quantitative methods are presented in the following subsections and are summarized on Figure 1.1.

Further and more in-depth details and discussion in the specific methods used in this thesis can be found in Chapters 2, 3, and 4.

1.3.1 Qualitative Methods

The present section presents a brief synopsis of the qualitative methods used to answer all three research questions of this thesis. Some of the qualitative methods used in the multi-method approach used to answer Q2 come from the participatory design (PD) and participatory research (PR) approaches in HCI and educational contexts, respectively (Chapter 3 and Chapter 4). PD and PR are considered in this thesis more than methodologies as research approaches due to their wide potential, complexity, and the large set of methods which co-exist within them. Each of the qualitative methods and a short description can be seen below:

Literature review. It was done an exploratory review to identify prior characterizations on forced migrants (youth) (re)settlement situation (e.g., challenges, needs, situation, and use of technology). It considered literature from research in diverse fields such as refugee studies, education, information science (IS), sociology, and HCI. The results from it served to address the Q1 of this thesis, i.e., the detailed insights gained can be seen in Chapter 2. Also, it provided insights to inform about Q2. Q2 was discussed by focusing on initial observations on PD and PR practices related to vulnerable communities such as children, forced migrants, and particularly young forced migrants (see Chapters 3, and 4).

Semi-structured interviews, as defined by (Lazar et al., 2010, p .189), were used in two different instances of the research. First, as part of a triangulation strategy on the results obtained from the literature review concerning challenges, needs, context, and use of technology of forced migrants during their (re)settlement. For it, individual and group-based interviews were done with forced migrants along with social workers and support staff working on temporary lodgings provided by the city council to newly arrived forced migrants in Münster. The interviews which were done in this first instance addressed Q1 of the present thesis. Second, group-based semi-structured interviews were done during the second iteration of participatory

workshops. They helped on gaining more in-depth information on the perception of young forced migrants in the participatory activities done as well as on the education content shared during this time. The results of these last interviews addressed Q2 of this thesis. More detailed explanations and insights on the results from the interviews held can be seen in Chapters 2 and 4. The qualitative data analysis (QDA) strategies utilized for the material gathered were based on the recommendations from (Saldaña, 2009; Uwe Flick, 2014).

Participatory workshops are one of the methods more extensively used in PD in HCI (Muller and Druin, 2012; Kensing and Madsen, 1992; Greenbaum, 1991). The first iteration of participatory workshops, done in 2016, focused on gaining closer feedback from young forced migrants in diverse aspects. First, on their challenges and needs upon arrival, particularly regarding the use of digital mobile services (Q1). Second, the two workshops' iteration also permitted to use and adapt (in-situ and posterior) PD and PR actions and strategies targeting particularly, the design of digital (geospatial) services with our group of co-researchers (Q2). It specifically helped to explore in detail the concept of “safe spaces” and reflective “safe spaces”. Insights gained from the results obtained can be seen in Chapter 2 for Q1, Chapter 3 and Chapter 4 for Q2.

Diaries are a commonly used method in qualitative research. Researchers' diaries were used in this thesis, in the first and second iteration of the participatory workshops, to document their experiences, observations, feelings and emotions during these activities (Kunz and Pfadenhauer, 2014, p .21). Semi-structured and open diaries allow gathering richer qualitative data by letting participants express themselves freely (Kenten, 2010). Participants' diaries are recommended by (Greene and Hogan, 2005, p .14) to research with youth and children. In order to enable the diaries to become tools for not only annotating and observing the activities but also as reflection mediators, reflective questions were created based on Dewey (1997) definition of reflective thinking. The data collected and insights gained helped to address Q2 of this thesis. Particularly, they supported the discussion on the creation of “safe spaces” in PD research in HCI. Further insights can be found in Chapter 4.

Brainstorming activities with sticky notes in large-format papers were done as part of the participatory workshops in their two iterations. Peterson and Barron (2006) state sticky notes are beneficial to ease and check grouping and sorting of ideas, as well as to verify understanding of participants. Based on such considerations, in this thesis sticky notes were seen to be able to promote the communication when sharing ideas in a group-based set-up. It addresses the fast-paced dynamics and particularities of working with this community (e.g., limited common language proficiency, cultural diversity). The results from these activities helped to answer,

principally, Q2 of this thesis (Chapters 3, and 4) along with the open-source geospatial prototypes developed (Chapter 5).

Paper prototyping has been widely used in PD-based projects in HCI with children (Hershman et al., 2018; Alhumaidan et al., 2018; Fisher and Yefimova, 2016; Druin et al., 1998). In this thesis, paper prototyping was used with young forced migrants as part of the participatory workshops. The goal was to ease their familiarization with tools to co-design their digital services. This rapid and low-fidelity prototyping technique was selected due to its easy-to-learn and easy-to-use capabilities. The use of paper prototypes helped to address the Q2 of this thesis. It also played a vital role on the design and development of the open-source prototypes for geospatial services to support young forced migrants upon arrival. Further details on insights gained from this can be found in Chapter 5.

1.3.2 Quantitative Methods

This section offers a short overview of the quantitative methods used to address Q1, and briefly Q2, of this thesis. Additionally, usability testing was explicitly used to assess one of the two open-source geospatial prototypes developed. The techniques and descriptions are referenced as follows:

Questionnaires are a frequently used method in HCI (Lazar et al., 2010). In this work, they were used in two instances. First, to support the co-researchers anonymous assessment of the first iteration of the participatory workshops. Second, as part of the usability testing of one of the two open mobile geospatial prototypes developed. Likert-scales were used as the main resources to answer and provide feedback in each of the questionnaires built. The results of these helped to address Q2 of this research. More details on the use of questionnaires can be found in Chapters 2 and 3

A survey of mobile applications is commonly used by researchers in HCI (e.g., (Hoang et al., 2013; Felt et al., 2011)). In this thesis, such a survey was used to identify the key gaps in existing mobile digital services created for and used by forced migrants. Categories for the assessment built upon the results of the semi-structured interviews with the diverse actors. The data gathered as part of this survey helps to answer the Q1 of this thesis (Chapter 2).

Usability testing was used to do the initial evaluation of one of the two open-source mobile geospatial prototypes as part of Q2 of this thesis. It was selected since it “involves representative user attempting representative tasks in representative environments” (Lewis, 2000 in Lazar et al., 2010, p .252) which includes testing

prototypes in diverse stages of development (from low-tech to high-tech prototyping). Its primary goal is to find flaws in an interface/system to improve its quality (Lazar et al., 2010). Further explanations and feedback on this can be found in Chapter 5.

1.4 Contributions

The present thesis explores and reflects upon participatory approaches as a way to enable co-design processes with young forced migrants. Particularly, to design mobile digital services which can support them upon arrival and during the initial phases of their (re)settlement in host cities. The exploration was done based on concepts from the fields of Human-Computer Interaction (HCI), as well as Education. The contributions of this thesis are as follows:

Contribution No. 1 consists of a set of challenges and needs of forced migrants upon arrival and during the first stages of their (re)settlement. It helps to answer Q1 of this thesis. Six core challenges and needs were identified for the case of forced migrants upon arrival to Münster, Germany. First, the minimal proficiency in the local language and thus, the need for German learning. Second, the restricted internet access as the need for digital mobile services to work properly on offline mode. Third, information complexity due to two main factors: information overload and type of visualization. Fourth, the lack of trustworthy information and the need for reliable and timely information. Fifth, the occasional limited experience on the use of geospatial services. And sixth, the sporadic presence of limited functional literacy which affects the access to information and the use of certain services.

Additionally, four main types of strategies for information access and sharing in a new information landscape (Kennan's transitioning and settling-in) were suggested during the interviews with forced migrants in Münster, Germany. These strategies were from forced migrant to/with: 1) other forced migrants (FM-FM), 2) local community and volunteers (FM-Local Community), and 3) members of official institutions (FM-Official Institutions). A fourth category was generated those forced migrants who stated they prefer to do not ask for guidance and to rely on the information they gathered by themselves.

Lastly, the exploratory assessment of currently available digital mobile services established gaps of these services in diverse areas. The analysis was based on the challenges, needs, and information sharing strategies mentioned above. The assessment indicated the need for mobile services to explore further multilingual features and interface modalities as a way to broaden their audience from Arabic-speaking forced migrants to others who speak other languages. The results from the

analysis done also highlighted the need for developing mobile services with fully available offline features. Third, it calls developers of mobile digital services for forced migrants to further delve into the possibilities open data presented as a way to address the issues regarding information timeliness and reliability.

Contribution No. 2 comprises a series of theoretical and on practices adaptations for participatory design (PD) in HCI. These adaptations are done to promote young forced migrants' participation during the co-design process of digital mobile services supporting their (re)settlement. This contribution addresses the Q2 of this thesis.

At the theoretical level, it was done a combination of PD principles with participatory research (PR) to design (geospatial) technologies with young forced migrants in Münster. Based on it, this thesis contributes to four main elements. First, PD's premise of "PD for useful systems" may not attain inclusion of all relevant actors. Second, "safe spaces", a concept from PR, seems to be essential in PD endeavors as well. Third, "didactic reduction" is an effective strategy to ease communication of research-related issues with young forced migrants. Lastly, the combination of PD and PR can facilitate critical competencies of sustainable development.

When talking about PD practices, four general suggestions were defined to promote more informed practices related to PD adaptations. These were based on the insights from PR when designing digital services with young forced migrants. The first suggestion discusses the value of "safe spaces" when conducting participatory HCI research with young forced migrants. It also discusses diverse strategies to enable them in formal and non-formal educational set-ups. The second suggestion details a strategy to promote intercultural collaborations in participatory projects as a way to support young forced migrants upon arrival in host cities. The third one refers to the use of various didactic and visual resources to address communication issues due to the limited proficiency in the selected "lingua franca". The last suggestion states that more flexibility in the ethics procedure is needed for the particularities of the young forced migrants' communities. However, such flexibility needs to guarantee a properly informed research and consent with this population group.

Contribution No. 3 encompasses a theoretical approach to enable "safe spaces" in participatory HCI with young forced migrants. The introduction of this approach allows assessing the initial impact of "safe spaces" in facilitating the participation of young forced migrants in co-design process of digital services to aid their (re)settlement. In such sense, "safe spaces", in its four components is presented as a more social sensitive participatory concept which aids PD process. The four components are referred to 1) ethics, 2) content, 3) set-up, and 4) facilitators' reflective processes. This contribution helps with the second part of the research question No. 2.

Some of the aspects of this approach referred to the use of reflective strategies to promote reflective and critical thinking in participants and researchers. It discusses elements such as appropriate compensation strategies with young forced migrants, the use of iterative and layered-up consent processes, as well as the use of participatory content strategies and the use of didactic reduction. It also assesses the impact of the location of the participatory activities, the use of a common language for the activities, the spatial distribution of the activities' space, and facilitators' behavioral agreements for building trust. The use of the "safe spaces" approach leads initially to more comfortable spaces in participatory HCI which during the activities ease the process of building trust among the diverse actors. Furthermore, the promotion of "safe spaces" raises the levels of engagement among young forced migrants participating in the co-design of digital mobile services to support them upon arrival and in their first stages of (re)settlement.

Contribution No.4 consists of two open-source geospatial prototypes for smartphones which were developed and one of them evaluated. These were done based on contribution No. 1 and the practical results from the participatory workshops done for contributions No. 2 and 3. The first solution is a Map+AR prototype done as a location-based service (LBS). It had an augmented reality view combined with a 2D map route guidance system which triggers only at decision points to ease navigation of unfamiliar urban environments. This and the follow-up prototype displayed in the smartphone screen augmented layers based on a set of geospatial information identified as relevant during the interviews and workshops held.

Finally, all contributions here presented are the result of a transdisciplinary research approach which provides theoretical and practical contributions to PD in HCI with young forced migrants. It combines strategies, concepts and approaches from education theory, HCI, geoinformatics, and information science (IS).

1.5 Thesis Outline

The presented chapter provides an introduction to this thesis. The following four chapters answer the research questions of this thesis. They also present this thesis findings' implications in participatory HCI with young forced migrants and the design of geospatial services for their arrival and first stages of (re)settlement. Figure 1.1 introduces the outline of this thesis.

Chapter 2 advances the understanding of forced migrants situation in Münster, NRW, Germany. It provides a closer look into challenges forced migrants face as well as the needs they have upon arrival and, in some cases, in the first steps of their (re)settlement in the host city. It also provides a first insight into their information

access and sharing practices during these stages. Subsequently, 36 digital mobile services used by or developed for forced migrants were identified. An assessment was done to determine initial gaps which are presented in this chapter.

Chapter 3 introduces PD and PR in the context of this research. Additionally, it presents theoretical and on practices adaptations to PD from combining it with PR. It also reflects upon the potential implications in HCI with young forced migrants and introduces concepts such as “safe spaces” and didactic reduction applied to a PD scenario. Chapter 4 develops further the concept of “safe spaces” and how to enable such spaces in participatory HCI research projects with young forced migrants. It details its main components and implications based on the case study carried out.

The final Chapter 5 of this thesis summarizes the main findings of it, and it addresses how each of the research questions are being answered. Moreover, it discusses the main implications of the findings on theory and practices in the field of participatory HCI, and especially when conducting participatory projects and research with young forced migrants. Lastly, in the chapter can be also found the core conclusions of this thesis and the possibilities for future work based on its results.

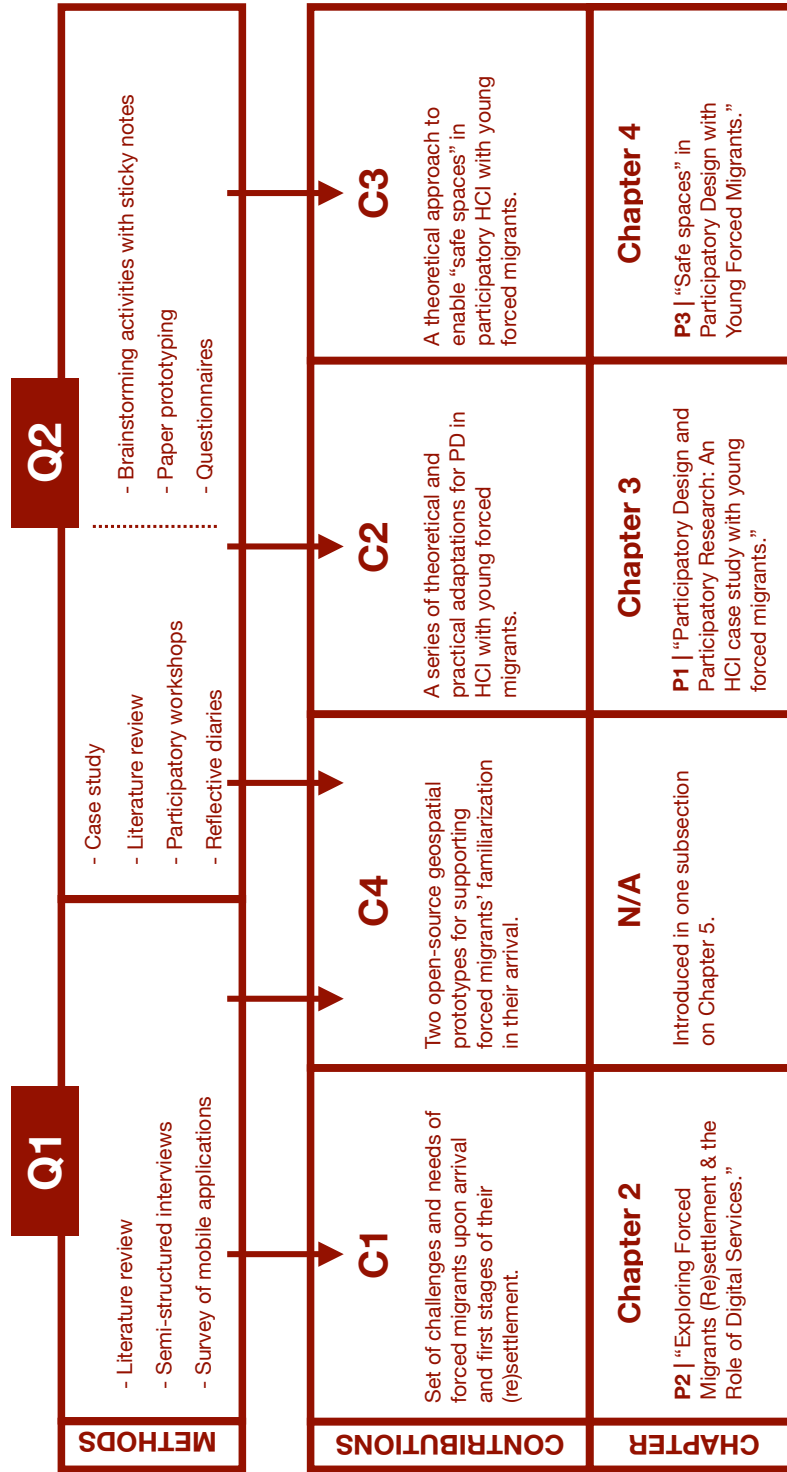


Fig. 1.1: Overview of methods, contributions, and outline of this thesis

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

This chapter was published in preparation to the 16th European Conference on Computer-Supported Cooperative Work - Exploratory Papers as *Ana Maria Bustamante Duarte, Auriol Degbelo, and Christian Kray. 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).*

It corresponds to the P2 in the List of Publications.

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.*

2.1 Introduction

Forced migration is a global phenomenon: around 65.6 million people in this situation were registered in 2016 (UNHCR, 2017b). 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, Peterson Bishop, Fawcett, et al., 2013; Marlowe, 2010). Nonetheless, they also encounter several challenges such as social isolation (Almohamed, 2016; Andrade and Doolin, 2016), information poverty (Caidi, Allard, and Quirke, 2010), cultural barriers, limited proficiency in the local language (D. Brown and Grinter, 2016), lack of trust (Almohamed and Vyas, 2016), as well as limited access to services and health care (Talhok, Ishtiaque Ahmend, et al., 2015; Talhok, Mesmar, et al., 2016). Various technological solutions have been developed to help forced migrants tackle these challenges e.g., (D. Brown and Grinter, 2016; Talhok, Montague, 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.

2.2 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. D. 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. Schrieck 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. S. M. Gifford and R. 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 Raelene Wilding and S. 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.

2.3 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.

2.3.1 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 (U. 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, Mesmar,

et al., 2016; D. 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, Allard, and Quirke, 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 (D. Brown and Grinter, 2016; Andrade and Doolin, 2016; Lloyd et al., 2013; Kennan et al., 2011; Danso, 2002), functional literacy (D. 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, Allard, and Quirke, 2010; Kennan et al., 2011; Caidi and Allard, 2005; Baranoff et al., 2015) and limited prior experience using technology (Talhouk, Mesmar, et al., 2016; Baranoff et al., 2015; Gillespie, Ampofo, 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, Allard, and Quirke, 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.

2.3.2 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; Schreieck et al., 2017; Andrade and Doolin, 2016; Gillespie, Ampofo, 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".

2.4 Findings

2.4.1 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."

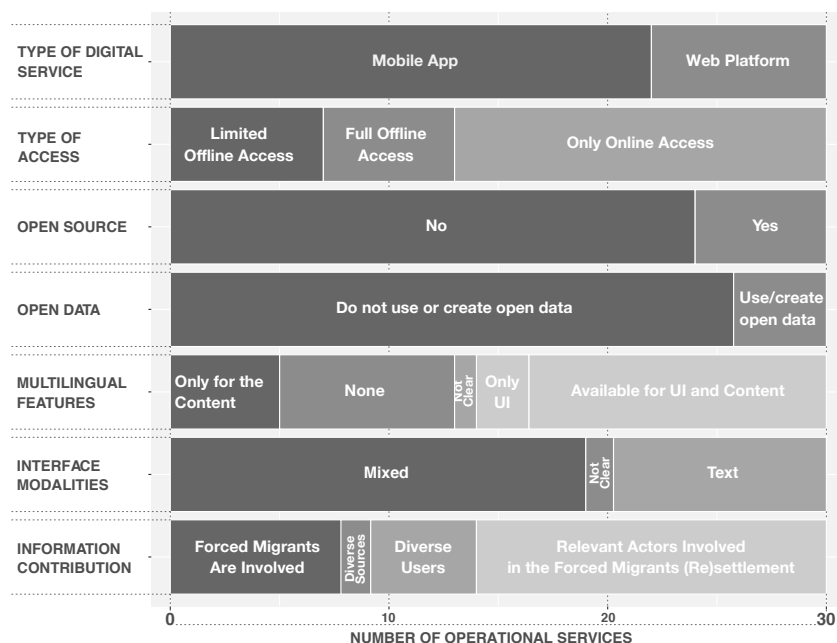


Fig. 2.1: Overview of main results of the survey study on operational existing systems

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 2.1). 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,

"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.

2.4.2 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*"¹(FM_P5, P8, P9, and P10).

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

¹The *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).

active features for forced migrants to constantly communicate with them (e.g., chats, posts) or to adapt the services.

2.5 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.

2.5.1 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 environment². 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.

2.5.2 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 Eritrea, Albania, and Afghanistan, who are also arriving in Münster are mostly not covered by these technologies. Additionally, forced migrants mentioned reduced internet

²Cognitive 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.

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.

2.5.3 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 to the needs and practices of forced migrants. Developing and incorporating more flexible and collaborative visualizations of the information (e.g., (Brodlić, 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.

2.5.4 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.

2.6 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.

Participatory Design and Participatory Research: an HCI case study with young forced migrants

This chapter was published in ACM Transactions on Computer-Human Interaction as *Ana Maria Bustamante Duarte, Nina Brendel, Auriol Degbelo, and Christian Kray. 2018. “Participatory Design and Participatory Research: An HCI case study with young forced migrants.” ACM Transactions on Computer-Human Interaction 25 (1): 1–39.* It corresponds to the P1 in the List of Publications.

Abstract. *Participatory Design (PD) in HCI has been successfully applied to vulnerable groups but further research is still needed on forced migrants. We report on a month-long case study with a group of about 25 young forced migrants (YFMs) where we applied and adapted strategies from PD and Participatory Research (PR). We gained insights into the benefits and drawbacks of combining PD and PR concepts in this particular scenario. The PD+PR approach supported intercultural collaborations between YFMs and young members of the host community. It also enabled communication across language barriers by using visual and ‘didactic reduction’ resources. On a theoretical level, the experiences we gained allowed us to reflect on the role of “safe spaces” for participation and the need for further discussing it in PD. Our results can benefit researchers who take part in technology-related participatory processes with YFMs.*

3.1 Introduction

Forced migrants face many challenges and hardships during the diverse stages of their migration process, i.e., fleeing home, transitioning, arriving at a new destination, and (re)settling. These may result in issues such as cultural shock, perceived or actual discrimination, and possible social exclusion, which can have an adverse impact on the (re)settlement process (Slonim-nevo, 2015; Te Lindert et al., 2008; Schweitzer et al., 2006; Danso, 2002). This, in turn, can lead to an intense feeling of disempowerment. These aspects can also prevent forced migrants from having a say in the development of tools and strategies meant to address their needs in the

new and foreign environment. In particular, young forced migrants (YFMs) stand to lose twice in this context: once by being excluded from the conceptualization and development process of such elements, and once more, when the tools and strategies meant to empower them during resettlement fail to meet their needs. These considerations emphasize the need for using participatory design (PD) and participatory research (PR) to involve young forced migrants in HCI projects.

We consider PD in this context due to its high potential for enabling users to be active contributors during the development of computer-related products and activities (Greenbaum, 1991; Muller and Druin, 2012). While PD in HCI was initially applied to develop systems in work environments, it was subsequently successfully used in other scenarios and with other target groups, e.g., to jointly design technology with citizens to convert their boroughs into living laboratories (Carroll and Rosson, 2013). The nature of PD promotes the empowerment of users (Hussain, 2010) and their role as design partners (Druin, 2002). Due to this characteristic, it is widely used to approach and develop projects with vulnerable communities such as children (Horton et al., 2012; Druin, 2002), older adults (Joshi and Bratteteig, 2016), and rural communities in developing countries (Camara and Abdelnour-Nocera, 2013). There also a few reports on its use in projects with groups of migrants and forced migrants in different setups (Aal et al., 2014; Fisher, Yefimova, and Peterson Bishop, 2016; Fisher and Yefimova, 2016; Fisher, Peterson Bishop, Magassa, et al., 2014; Fisher, Peterson Bishop, Fawcett, et al., 2013). Furthermore, PD facilitates the inclusion of diverse voices in the design process, i.e., researchers, users, designers, developers (Nesset and Large, 2004; Muller and Druin, 2012; Bødker, 1996; Greenbaum, 1991). While PD has been successfully applied to different (vulnerable) communities, its use with forced migrants, particularly young forced migrants (YFMs) requires further explorations.

Similar to PD, participatory research has also been used to work with vulnerable communities (Ponzoni, 2015; Laoire, 2015; von Unger, 2012). PR is described in the literature as a way to gain deeper and better understanding of the targeted group while bringing them on board as research partners (Bergold and Thomas, 2012). It uses bottom-up, flexible and reflexive strategies to reinforce users as co-researchers, e.g., via the creation of "safe spaces," or promoting various levels of participation. Moreover, one of the primary objectives of PR is that research should result in clear actions, methodologies, and improvements in research practices. Meaning, PR also aims to produce practical strategies or tools that have an immediate positive impact in the community involved in the research work (von Unger, 2014). All these properties point to PR being a promising approach to work with vulnerable communities, including forced migrants, in participatory processes in HCI.

This article describes a research project that explored the extent to which a combination of PD and PR approaches can be useful in understanding the YFMs' context at the initial stages of their (re)settlement process, while building trust with this group during a dynamic participatory project with them. We further report on adaptations we deemed necessary for dealing with the main challenges encountered, on the opportunities that arose in the process, and on the lessons learned for future research with young forced migrants using methods and strategies from PD and PR. More specifically, our contributions to critical PD areas presented in this article are 1) reflections on the participants' and researchers' experiences and roles in the PD process, and 2) insights into the advantages and disadvantages of combining PD and PR while working with YFMs. These contributions result from a case study, which we conducted with adolescent forced migrants (refugees and asylum seekers) between 16 to 18 years old located in Münster (Germany), and which ran over a period of four weeks in 2016.

The remainder of this article is structured as follows. In section 3.2, we first review related work in PD and PR in general, and provide a summary of opportunities and gaps of both approaches that we identified based on previous projects. Section 3.3 outlines the broader context of our research by describing the case study and its participants in more detail. Section 3.4 reports on the series of workshops that we held over the course of the project. It also analyses how different aspects of PD and PR were considered during the research, and it highlights relevant ethical considerations when working with YFMs. Section 3.5 summarizes our key findings by outlining challenges and opportunities we identified when combining methods from PD and PR. We also briefly discuss limitations of the case study. Section 3.6 discusses a series of aspects for further evolving the method and proposes a set of lessons learned. The final section 3.7 briefly summarizes our contributions and identifies promising future work based on our findings.

3.2 Related Work

This section reviews related work on participatory design, participatory research, as well as relevant previous work on forced migrants and technology research, particularly in HCI.

3.2.1 Participatory Design

Participatory design (PD) can be understood from different perspectives and fields, including computer science. It was initially included under the "cooperative design" (Halskov and Brodersen, 2015) and based on the Scandinavian experience designing

systems (Bødker, 1996; Halskov and Brodersen, 2015). It was expected to aid the development of systems that supported users' activities, e.g., how they work, and how they interact (Greenbaum, 1991).

PD can be considered as an approach that aims to design systems while building a connection and promoting active work between its targeted population group and its developers. Those groups were frequently separated in the past during this process due to their differing experience levels (Greenbaum, 1991; Halskov and Brodersen, 2015). As a way to address this, PD enables the creation of a new space, the "third-space", where a collaboration process combining both groups' experiences is promoted through the use of novel ways of communication (Muller and Druin, 2012).

Within this general framework, PD has five fundamental aspects which were identified by Halskov and Brodersen (2015). First, *politics* is defined as the opportunity to influence. Second, *people* all are experts about themselves and their actions. Third, *context* represents the general situation, and its characteristics need to be used as a starting point. Fourth, *methods* are considered as the "means for targeted group(s) of people to influence the design". Finally, *product* refers to the result of design alternatives while improving quality of life. Several core considerations and concepts have been described in the literature (Halskov and Brodersen, 2015; Bødker, 1996; Muller and Druin, 2012; Greenbaum, 1991), which relate to Halskov and Brodersen (2015)'s fundamental aspects in PD. These key elements are:

1. *Diverse participation and democratic decision-making.* PD in computer science results from the goal of promoting democracy in the workplace (Muller and Druin, 2012; Halskov and Brodersen, 2015; Greenbaum, 1991). The main objective of PD is based on democratic ground. It aims to have broad participation from the target group of a system or device in order for them to have more control over the general design process and to propose and decide on its design, e.g., content, materials, interface, setup (e.g., (Joshi and Bratteteig, 2016; Muller and Druin, 2012; Muller and Kuhn, 1993; Kensing and Munk-Madsen, 1993; Greenbaum, 1991)). As a result, the "presence of diverse voices" (e.g., developers, potential users, researchers) in the generation of knowledge and the design process are encouraged (Bødker, 2002; Suchman, 2002; Muller and Druin, 2012; Muller and Kuhn, 1993; Greenbaum, 1991). In this sense, everybody's opinions can have a direct impact on the final design, or it can emerge by democratic means selecting the best options and coming to agreements. These conditions define the design process as occurring in a political space where common agreements address conflicts and diversity of presence (Greenbaum, 1991). Halskov and Brodersen (2015) state this aspect

of participation is valid, but it is being challenged by the appearance of highly diverse new application scenarios in the PD practice.

PD especially empowers groups of people who are regularly misrepresented in some settings (Muller and Druin, 2012; Druin, 2002). In the PD projects with these groups (e.g., children (Hussain, 2010; Druin, 2002)), PD researchers are constantly analyzing the participants' role and their real influence in the design decisions.

2. *Mutual learning, testing of premises, and generation of new concepts.* Kyng (1996) states "mutual learning" as one of the main elements in the use of collective resources for systems development. It results from that "space" where all involved stakeholders meet, discuss, engage in a dialogue, and negotiate about the process and the product (Muller and Druin, 2012). In this space, the participants do not take opposing roles and perspectives trying to find a middle ground (Muller and Druin, 2012). On the contrary, with the use of certain methods, participants' positions and choices can change freely in different moments (Muller and Druin, 2012). To generate mutual knowledge and possible alliances (Muller and Druin, 2012) participants need to go beyond their situation, their own experiences, which in general poses a challenge for every PD process (Suchman, 2002).

In this sense, PD needs to be based on the idea that its participants are groups of experts interacting. However, each group has limited prior knowledge of the other (experience, behavior), and to be part of a process, mutual learning becomes essential (Joshi and Bratteteig, 2016). Overcoming these challenges and leveraging the group's dynamic is a significant aspect of PD, which is continuously addressed by developing new concepts and shared understandings relevant for the overall design process (Joshi and Bratteteig, 2016).

The former point is a central component not only for PD but also for many other approaches used in HCI, such as user-centered design. However, PD distanced itself from the user-centered design movement in the 1980s (Greenbaum, 1991). The role of the user becomes essential for this differentiation. For the latter, the user is only seen as an evaluator, who provides insights mainly at the end of the design process. In contrast, in PD the participants have a voice in the multiple processes of data collection and analysis, the conceptualization of the product, its development and its evaluation. In summary, the mutual learning process and the new insights resulting from it are a sign of the democratic dynamics, which constitute PD's core and helps to increase the quality of the development (Muller and Kuhn, 1993).

3. *Iterative actions in PD* are required to achieve a final design of an artifact that answers to the participants' requirements and ideas. An in-depth understanding of these elements cannot be obtained in only one or two sessions. PD processes require continuity in the events, which build upon each other, and despite occasional deviations, the whole process results in a commonly designed artifact (Joshi and Bratteteig, 2016). Referring to this aspect, Halskov and Brodersen (2015) mention that participatory processes are sequential, and that they connect spaces of transition where interpretation, planning, and decision-making happened. Moreover, Joshi and Bratteteig (2016) consider PD as an iterative process which has different stages: determination of the use context, recognition of needs and requirements, establishing design suggestions, trying the artifact, and evaluating it. Each of these steps and iteration cycles is essential for the development of the product by allowing all stakeholders involved to understand the design process and see its evolution.

As mentioned before, these elements constitute a common foundation for PD as it is used in HCI-based projects. However, Vines, Clarke, P. Wright, et al. (2013) define some key pressing aspects that PD still needs to address. These include the multiple definitions used for participation, the analysis of the participants' and the researchers' roles, as well as the ongoing discussion about the several possible levels of participation that can be present. Also, Vines, Clarke, P. Wright, et al. (2013) highlight the challenge facing PD process of making clear to the participants how their voices will be represented and used within the design process. Lastly, the authors mentioned the need for a larger and more transparent process of communication where the reasons for selecting particular participants and the study framework are explained.

Regarding PD practices, Halskov and Brodersen (2015) pointed out that researchers and practitioners use different strategies and design techniques (e.g., ethnography, cultural probes, prototyping) across various stages of the PD process. However, in some cases, the transition or gap between passing from the use of one to the other are not detailed in the research papers (Halskov and Brodersen, 2015). Several of these methods have been created and mostly employed in different HCI waves, mainly in the second and third (Bødker, 2015; Bødker, 2006). For example, wood or paper mock-ups (Bødker, 1987), prototyping, and group workshops (Muller and Druin, 2012; Kensing and Madsen, 1992; Greenbaum, 1991) are having a significant impact on the implementation of 'third wave' projects. Bødker (2006) states that PD is mainly considered a second wave method. Additional techniques have been developed in the 'third wave' while working with children, elderly or other types of people outside work setups. These include the use of sticky notes (Peterson and Barron, 2007; Peterson and Barron, 2006), layered elaboration (Walsh, Druin,

et al., 2010), storytelling (group (Kankainen et al., 2012) or individual), and theater play (Walsh, Foss, et al., 2013). Nonetheless, as Kensing and Munk-Madsen (1993) point out, there is no single method to answer every specific case of communication during system development.

Overall, PD can be considered a highly flexible method (Halskov and Brodersen, 2015), which can adapt to many contexts, groups of population, and conditions. As a result, it has been an approach widely used with several vulnerable population groups, e.g., elderly, children, and forced migrants. In technology development with elderly communities, for example, Joshi and Bratteteig (2016) conducted a PD study for three years in a care home. In this study, the researchers aimed to see what was the role of the members of this community in the PD process and how PD could be tailored to promote the participation of the elderly population. They provide detailed insights in how they customized the "recruiting, timing, continuity, representativity, and immediacy" aspects of the PD process while working with this group. Furthermore, several research projects have been conducted on PD with children (Druin, 2002; Druin, 1999; Druin et al., 1998). Druin (2002) evaluates the particular role children have in PD processes related to new technology development. In that study, Druin (2002) identified four primary roles of children in these events: "user, tester, informant, and design partner."

Similarly, some research has been done related to the use of PD (alone or combined with community-based design) with forced migrants and technology development (Fisher, Yefimova, and Peterson Bishop, 2016; Fisher and Yefimova, 2016; Fisher, Peterson Bishop, Magassa, et al., 2014; Fisher, Peterson Bishop, Fawcett, et al., 2013). For instance, Fisher, Peterson Bishop, Fawcett, et al. (2013) proposed and evaluated the Teen Design Days (TDD) as a multidisciplinary approach to promote community development in groups of youth who are considered to be an ethnic minority with a migration background. The project called "InfoMe" mainly studied the role of this group as information and technology mediators within the community (Fisher, Peterson Bishop, Fawcett, et al., 2013). Also, Fisher and Yefimova (2016) conducted several PD workshops at the Za'atari refugee camp in Jordan. These workshops aimed to understand the role of Syrian youth refugees in helping other members of their community to access and use technology and information (Fisher and Yefimova, 2016). The authors discovered that young Syrian refugees played a major role in this process (Fisher and Yefimova, 2016). In general, these research studies emphasized the need to be open and flexible while working with youths who have migration and forced migration backgrounds.

Finally, PD can be combined with other participatory approaches. In its more general framework and its implementation, it shares some properties with a few of

those approaches, e.g., participatory research (PR) and participatory action research (PAR). PR is introduced in the next section.

3.2.2 Participatory Research

This section will provide the reasons behind combining PR (and not another related concept) with PD in this study. We will also describe the differences and similarities between the two approaches. Similar to PD, PR aims to promote the involvement of the population affected by a situation or problem in the research process. According to Bergold and Thomas (2012), participatory research methods are generally "*geared towards planning and conducting the research process with those people whose life-world and meaningful actions are under study*". In participatory research, the selected population group is not seen as the object of study that has their say once in a while. On the contrary, they become co-researchers and equal partners. Thus, all partners have the same rights and competence to set up or refine the research question and to examine the object of study (Bergold and Thomas, 2012).

The research is thus tackled from two sides as the researchers and the co-researchers bring in their perspectives. Both stakeholders step outside their usual point of view. Co-researchers reflect on their everyday routines and bring in new ways of conducting research. Researchers benefit from this new impetus while also being asked to review their systematic approach to research. As promising as this collaboration is perceived, it also comes with challenges for both parties (Bergold and Thomas, 2012).

In PR, similarly to PD, it is not possible to create a fixed set of methods or procedures due to the inherent fluidity of the underlying processes. Negotiation between researchers and practitioners is intrinsic to PR, and it depends on the object of study and the research question how the research is carried out. All persons involved must collaborate to identify the most suitable methods in order to obtain a fruitful outcome. Consequently, PR is not regarded as a particular research method but rather as a research style (Bergold and Thomas, 2012).

While PR is a well-established research method in the social sciences, it is relatively new to HCI research (but increasingly popular) (Vines, Clarke, Light, et al., 2015). It has yet to define its specific characteristics in HCI, which is a discourse that was recently initiated by Vines, Clarke, Light, et al. (2015). In that sense, it is different from other approaches closely related to PR, which has been more frequently used in HCI, such as action research. In HCI, action research aims to involve community partners to introduce underrepresented groups to computing and to tackle social problems collaboratively (Hayes, 2011). Action research also

shares with PR the idea of involving practitioners democratically (Hayes, 2011) during the research process but puts a stronger emphasis on changing a practice than PR. In general, PR focuses more on the collaboration between researchers and practitioners to enhance the research process (Bergold and Thomas, 2012). This can mean that practitioners' concerns and insights lead to a redefinition of the research question or methodology, or that they change the perception of the intention of the research or the matters it aims to address. In this respect, PR differs from action research and PD, both of which focus more on changing a practice or collaboratively developing a product and less on the research process itself. Some branches of action research strive for a fusion of both concepts such as Participatory Action Research (PAR) (Bergold and Thomas, 2012), and in practice, those related concepts often overlap.

While participatory approaches have been used in HCI for many years, the definition and perception of participation vary significantly (Saad-Sulonen et al., 2015; Halskov and Brodersen, 2015). In practice, PR and PD in HCI often overlap, which is why some authors also use the term "participatory design research" (Halskov and Brodersen, 2015). Vines, Clarke, P. Wright, et al. (2013) mention that PD should more extensively address the question of what is meant by participation. They also state that further discussion is required about the different levels of participation and the diverse definitions of these levels. PR can contribute towards addressing these issues in PD as its principles provide a clear concept of participation, its levels and the challenges that come with it. Bergold and Thomas (2012) summarize those principles of PR as follows:

1. *Participatory research demands democracy.* Democratic working processes are crucial for an efficient and equitable research process when working with underprivileged and vulnerable communities. von Unger (2014) argues that co-researchers should contribute to all stages of the research process as equal partners, e.g., stages such as research design, data collection, data analysis. It is also a principle of PR defined by the International Participatory Research Network in the late seventies (Coghlan and Brydon-Miller, 2014). However, the degree of participation from the co-researchers can vary depending on their particular situation and interest.
2. *Defining the "community" and its "empowerment".* Studies in PR show a great variety regarding the type of people involved in the research. In some projects, the research is carried out by (professional) practitioners, so-called "practice-partners" (von Unger, 2012), while researchers only assist and review the process. In contrast, other projects in PR involve "*marginalized groups whose views are seldom sought, and whose voices are rarely heard*" (Bergold and

Thomas, 2012). An opportunity opens up with PR for them to contribute their thoughts and ideas and empower them to change their situation. These groups of people are denoted as "community-partners" (von Unger, 2012).

The question who should be involved in PR depends on the experiences and voices which particularly are relevant to the research question. A significant challenge of PR is defining the group of people to target and identifying and including representatives of all groups affected by a problem. C. L. Dantec and Fox (2015) stress the importance of those decisions before starting a participatory HCI project and the relevance of including them in the planning process of the research. Regardless of this classification, all partners of participatory projects in HCI should be given the opportunity to "contribute to the making of something of value to others" (Lundmark, 2016) in order to empower them to change the practice or living conditions of themselves as well as their peers.

In this sense, von Unger (2014) highlights the importance of empowerment. She states that PR does not only intend to involve participants but also aims at augmenting their knowledge and promoting competencies. This, in turn, enables them to modify their practice or change their situation. PR has two ways to achieve this objective: 1) training and workshops as part of the PR projects, and 2) participants reflecting on their practice and alternative options for action (von Unger, 2014). By these measures, the co-researchers can develop competencies that empower them to engage in long-term social participation (von Unger, 2014) and to regard the research process as their work.

3. *Creating a "safe space"*. Trust and openness are required among researchers and collaborators (practice-partners and community-partners) to allow the former to have insight into the latter's personal lives on a regular basis. It is even more important when the research process can bring up opinions that contradict socially desired beliefs and values. Specifically, this refers to statements that people might be embarrassed by or are afraid to express. These types of testimonies are highly valuable for PR to retrace the community's and the practitioners' perspectives. Therefore, researchers should make an effort to create a communication setting in which their partners are invited to express their opinions and values freely and without having to fear stigmatization (Bergold and Thomas, 2012). Creating a "safe space" is of utmost importance when working with vulnerable, such as sexual assault survivors (Campbell et al., 2004), children (Groundwater-Smith et al., 2014) or refugees (Neill, 2008; Neill and Harindranath, 2006; Westoby, 2008).

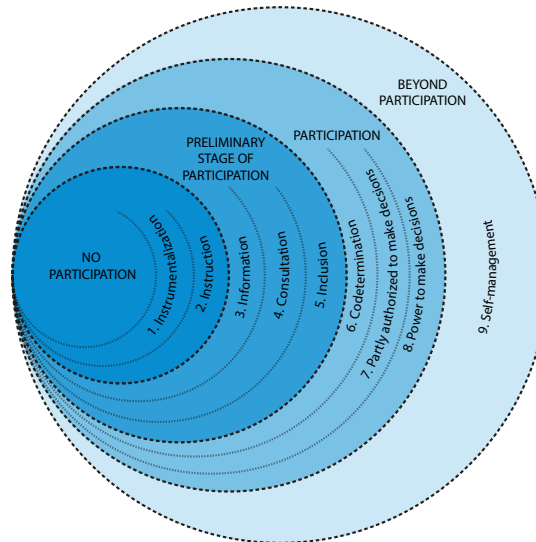


Fig. 3.1: Stage model of participation based on M. Wright et al. (2010) (also translated into English)

4. *Different stages of participation.* After having specified, which groups of people will be collaborators, the question arises as to what should be the degree of their participation. For this, several participation models currently exist, mostly based on the seminal work of Arnstein (1969). One of the most frequently used ones is M. Wright et al. (2010)'s "stage model of participation" (Figure 3.1).

In this model, nine levels are specified to define participatory processes (von Unger, 2014). While levels one to three are, strictly speaking, not considered as participation, levels three to five are valuable prerequisites for participatory processes. Once a process reaches level six, it can be regarded as being truly participatory. At this level, practice-partners or community-partners are (partially) given the power to make decisions (von Unger, 2014). Within the stage of participation, M. Wright et al. (2010) distinguish three levels. At level six, co-researchers are not only consulted or asked for their opinion (as it applies to the preliminary stages). They are also encouraged to make decisions concerning the research process while liaising with the researchers. At level seven, they are authorized to implement minor project components of the research process at their discretion. Reaching level eight, the power and control over decisions shift from researchers to co-researchers. At this level, practice- or community-partners take important decisions essentially by themselves, while researchers assume the role of mere consultants. Level nine surpasses participation, as individuals take full responsibility and possess total decision power. At this stage, researchers are no longer involved (von Unger,

2014). Consequently, only levels six to eight qualify for an actual participation of all partners, as demanded by PR.

According to von Unger (2014), a constituting element of PR is to involve at least some members of all groups affected by all stages of the research process from study design to implementation. Still, it is acceptable to flexibly adjust the level of participation of all the groups during the research process according to the conditions (von Unger, 2014). M. Wright et al. (2010) (M. Wright et al., 2010), in contrast, do not demand the same degree of involvement from each stakeholder in a participatory process. For example, a research project might have one group of individuals participating at level seven, while another group is at level four. In some cases, they might also not be able or willing to participate at higher levels.

Within the field of HCI, levels of participation range from mere consultation of users and testing by them to groups organizing themselves and consulting researchers, who rather take on the role of observers (Vines, Clarke, Light, et al., 2015). Also, the concept of participation is often defined differently in the HCI-PR literature (Halskov and Brodersen, 2015). This is why it is crucial to discuss and reflect on the degree of participation in a study (Vines, Clarke, Light, et al., 2015).

5. *Dual objective.* According to von Unger (2014), another essential characteristic of PR is to comprehend social reality on the one hand and to change it on the other. Gaining knowledge is as important in PR as deriving possible actions to improve a situation or routine, or to create opportunities for democratic participation and capacity-building (von Unger, 2014).

Due to the aim of PR to collaborate with often overlooked individuals or communities, many studies in this area focus on vulnerable communities. PR has been used in several projects with migrants or migration-related actors as primary targets. Laoire (2015) carried out a study targeting young migrants in Ireland with returning Irish families. Ponzoni (2015) conducted a research project with an immigration organization and parenting support services in Amsterdam. The PaKoMi-study (von Unger, 2012) is another example. It worked with the "Deutsche AIDS-Hilfe" (German AIDS-Relief Association) and sex workers from Africa, and Central and Eastern Europe in Germany. The study took three years, and its research team conducted participatory case studies in four German cities to increase cooperation and participation of migrants in HIV-prevention. Initially, a "community-outreach" was carried out to bring people together and listen to their everyday life experiences and challenges.

Based on these, researchers and co-researchers jointly identified needs for action and set goals of the research project (von Unger, 2012).

von Unger (2012) determined several challenges and recommendations for future PR-based projects involving migrants. First, the author reported problems of mis-communication and prejudices, which were often due to language barriers and low literacy levels of the target group. In their study, this problem was eased by using visual aids such as comics. Secondly, von Unger (2012) stressed the importance of using every participant's strengths so that everybody can bring in their potential. Ideally, PR deals with all involved to the same extent and empowers everybody with the same rights and competences (Bergold and Thomas, 2012). However, von Unger (2012) highlighted that researchers always have an advantage and are more experienced when it comes to research. Therefore, a real balance of power among professional researchers and co-researchers is very difficult to achieve.

Furthermore, von Unger (2012) argues that PR faces a dilemma or paradox as it aims at involving people whose chances of participation are the lowest. *"This means the necessity to act is exceptionally strong, while the prerequisites for participation are quite unfavorable."* (von Unger, 2012) The author also states that PR creates high expectations with its goal of capacity building. Consequently, researchers and co-researchers have to face the risk of failure that could result in negative (research) experiences for the vulnerable groups involved in this project. Similarly, Laoire (2015) stressed the importance of considering the effect on the members of the vulnerable community who participate in a PR project. They state that this particularly important when involving young migrants, adolescents or children. Losing their homes and building a new one in the time of growing up can result in multiple identities of self. According to the author, PR can offer opportunities to express these identities even if they contradict each other, e.g., by using multimodal methods.

Finally, another aspect that needs to be considered when collaborating with people with a migration background is the issue of different ways of communication. In a PR project with organizations that support immigration and professional parenting support services in Amsterdam (Ponzoni, 2015), the researchers at first complained about the newcomers "missing the point" in interviews and telling stories instead. After a stage of brainstorming, however, they came to realize that telling stories and anecdotes were their participants' way of communicating information. After 'translating' the stories and adapting the way of communication with the group of people with migration backgrounds (e.g., by rephrasing and validating what was said and understood), the interviews emerged as much more fruitful and beneficial for both parties (Ponzoni, 2015).

3.2.3 Summary

The above Subsections have focused on aspects of PD and PR which are relevant to HCI research with young forced migrants (YFMs). As PD can facilitate mutual learning (Muller and Druin, 2012), its relevance for this research comes from the possible knowledge exchange among YFMs, facilitators, and other relevant stakeholders engaged in such a participatory project. Moreover, PD has the potential to stimulate a more democratic process of decision-making (Muller and Kuhn, 1993), which in turn could enhance collaborative "knowledge acquisition" (Muller and Kuhn, 1993) with YFMs groups and other relevant actors, who are part of their (re)settlement process. Overall, the focus of PD is on the design act as the main instrument for engaging with the community, for obtaining detailed knowledge, and for co-creating solutions with the primary user group.

As for PR, we consider several aspects relevant within the context of working side-by-side with YFMs (Figure 3.2). PR strives to involve co-researchers during all stages of the research at a high (but flexible) level of participation. Its emphasis is more on the development and adaptation of the specific research elements, e.g., research questions, objectives, methods, data analysis, and outcomes. Some authors in PR also mentioned that the most important aspect is to maximize participation as much as the co-researchers desire and feel comfortable with, e.g., (M. Wright et al., 2010; von Unger, 2014). Since putting pressure on co-researchers to participate can adversely affect the research, awareness of the unavoidable imbalance of power during the implementation stage is crucial (von Unger, 2012). The creation of a "safe space" can address this problem, especially when working with YFMs. It requires a careful selection of collaborative methods and democratic ways of participation that support these types of spaces, e.g., brainstorming sessions, workshops, or field activities. Based on the PD and PR literature, we can observe that it is essential to have a clearly defined target community from the start and adapting the communication style to their cultural characteristics and language. Consequently, our project should respond to the dual objective of PR: gaining insight into the target community's situation and needs on the one hand and contributing to the transformation of their social reality by fostering competencies on the other.

For the most part, it can be stated that PD and PR are not opposite frameworks but rather overlap in several points. Although PD emphasizes the creation of a tool while PR focuses on the research process, they complement each other in several aspects. As a result, in the context of this study, the project team expected that combining these two approaches would lead to enhanced practical and theoretical outputs through procedures that are suitable for research with vulnerable groups, specifically YFMs. PR, for example, provides the opportunity to address Vines, Clarke, P. Wright, et al. (2013)'s questions regarding the definition of the panel of

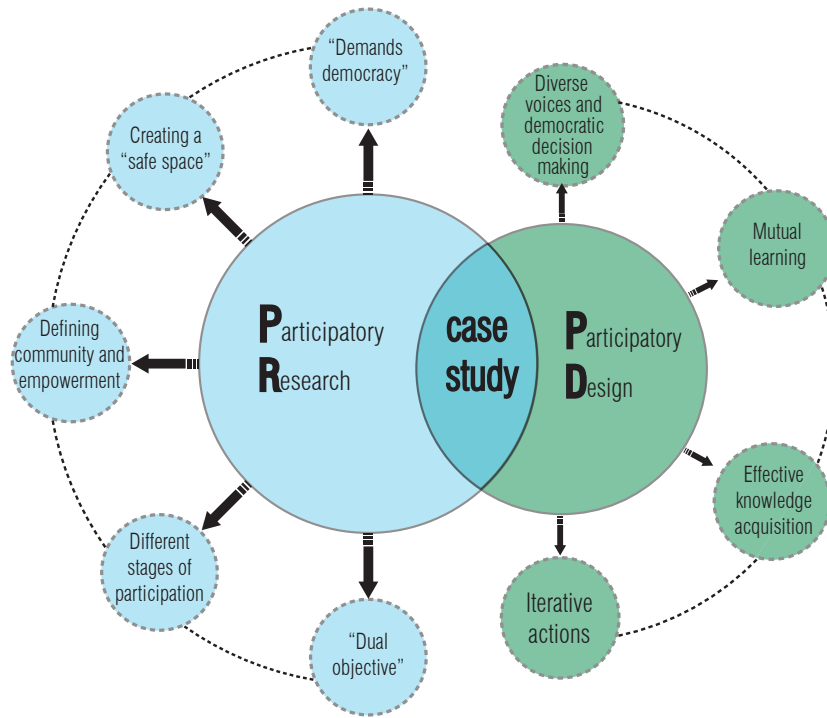


Fig. 3.2: Components from PD and PR considered for our case study.

participants and their levels of participation. Also, PR can help to (re)define the roles of the researchers and participants in PD, particularly, with groups of YFMs. All of these elements become highly relevant for projects with YFMs, where the understanding of the interaction across methods, communication, and relationships among all involved actors are crucial.

Nonetheless, an important element to consider when using various participatory methods and tools (including the ones from PD and PR) in HCI projects is that, despite the fact in HCI are now available a large variety of these, the researchers in this field still have a limited comprehension on the one they can use and the reasons for it depending on the specific situation (Vines, Clarke, Leong, et al., 2012).

The PD and PR-related elements presented above shaped our research project in several ways. In particular, we considered the following aspects to be quite important in this context.

- Including multiple voices in the research and design process by targeting two main population groups related to the topic of forced migration. These groups are young forced migrants and members of the host community.

- Defining and balancing the appropriate levels of participation of each actor, based on M. Wright et al. (2010)'s model, for the diverse research and design stages and related decisions.
- Establishing "safe spaces," where young forced migrants, researchers, and young members of the host community could freely reflect and express their needs, their context, and their views of the role of the technology, its purpose, and its design.
- Reflecting on creative strategies to stimulate interaction among the actors and the integration among these diverse of groups. We thus focused on dynamic, flexible, and open communication strategies.
- Specifying a "product" to design and reflect on it. This was presented as an opportunity to enhance communication, discussion and collaboration processes with YFMs and young members of the host community on a topic of possible impact for both groups.

In general, the research reported in this article aims to enable the research team to gain a deeper understanding of the advantages and disadvantages of using PD and PR to build trust with young forced migrants. It also intends to gather initial insights about the YFMs' context and to identify the requirements for a technology-related tool which will support them in their (re)settlement process. Therefore, it contributes to *expanding PD characteristics by combining it with PR, along with widening it into a new domain of application and use, i.e., supporting forced migrants during (re)settlement.*

3.3 Case Study

In this section, we aim to describe the general context of the study and to present its potential impact. We first introduce the concept of forced migration. Then, we present the role of technology-based research within HCI in addressing challenges of forced migrants. Finally, we provide information about the context of our research project which took place in Münster, Germany.

3.3.1 Forced migration

Forced mass migration occurred throughout human history. It is defined as the movement of population groups who are forced to resettle in a geographically different place due to diverse reasons. It may be due to violence, famine, or natural,

chemical, nuclear and other hazards but it can also be caused by less visible factors, such as development projects that affect people's livelihoods (UNESCO, 2017; *What is forced migration?* 2012). Forced displacement can refer to internal displacement, where the affected population relocates within the same country (i.e., internally displaced people -IDPs-) or external displacement, where people move outside their home country (i.e., refugees and asylum seekers) (*What is forced migration?* 2012; UNHCR, 1951). The rights and status of refugees are defined by Article 14 of the 1948 Universal Declaration of Human Rights, as well as the 1951 Refugee Convention (UNHCR, 1951).

The current flows of forced migrants are large in volume, extended over time, and diverse regarding origins as well as destinations. Many are fleeing from countries facing socio-political upheavals, including Afghanistan, Somalia, South Sudan, Syria, and Sudan (UNHCR, 2017a). These refugees and asylum seekers are looking for shelter in the Middle-East, Africa, and Europe, among other regions. For example, by the end of 2016, Africa hosted approximately 4.4 million refugees, while the European countries (without Turkey) hosted 2.3 million refugees (UNHCR, 2017b; Eurostat, 2016). These figures illustrate the relevance and urgency for creating new support strategies and mechanisms (including cultural, spatial, social, and economic ones) for refugees to help them transition from their original homes to an unexplored and unfamiliar environment. These transition processes are extremely complex (Stein, 1981) and pose significant challenges to forced migrants. These include, among others, a lack of guidance in the local institutional context, limited employment opportunities, and limited access to health care (Danso, 2002; Elliott and Gillie, 1998; Schweitzer et al., 2006; Slonim-nevo, 2015; Stein, 1981; Te Lindert et al., 2008). Since forced migrants often have very little knowledge of the new local language, they are severely limited when dealing with the amount and complexity of information they are required to process (Lloyd et al., 2013). These kinds of barriers can at least partially be addressed by the use of technology.

3.3.2 The Role of Technology and HCI in Forced Migration

Technology already plays an important role for forced migrants especially for communication purposes, as well as a tool for finding information in different situations during their journey, e.g., displacement, arrival, social integration (Brunwasser, 2015; Kutscher and Kreß, 2016; BenEzer and Zetter, 2014; Andrade and Doolin, 2016; Kennan et al., 2011). However, accessing and understanding the information in the host country often require skills which can be beyond the forced migrants' proficiency of the local language, and occasionally, their literacy competency (Lloyd et al., 2013).

HCI can play a major role in addressing diverse challenges faced by forced migration. For example, some HCI research projects with forced migrants have focused on topics such as: participatory community building through mapping technologies (Xu, Maitland, and Tomaszewski, 2015), a human-in-the-loop translation tool for refugees' transient use (D. Brown and Grinter, 2016), refugees' health care provision (Talhok, Montague, et al., 2017; Talhok, Mesmar, et al., 2016), navigation of new places (Baranoff et al., 2015), and general ICT design processes (Almohamed, 2016; Fisher and Yefimova, 2016; Fisher, Yefimova, and Peterson Bishop, 2016). Moreover, research in HCI has also investigated the role of technology-enabled spaces in supporting refugees. An example of this are the projects of Yerousis et al. (2015) and Aal et al. (2014). The authors studied the German computer clubs (Come-IN) and their implementation and impact in a Palestinian refugee camp. In these projects, the computer clubs promoted social ties among the community and encouraged diverse learning processes among the participants, i.e., volunteers, residents, and researchers. Nevertheless, as mentioned by Talhok, Ishtiaque Ahmend, et al. (2015), there is a lack of research in HCI regarding the design and implementation of platforms and tools that consider the experiences, knowledge, challenges, needs, and skills of refugees, and that supports their familiarization with the new urban environment. Moreover, the author also states that HCI has the potential to help refugees to integrate into the new social and cultural context (Talhok, Ishtiaque Ahmend, et al., 2015).

Considering this context, our project complements work on evolving and expanding PD in other domains such as health-care and developing countries (as identified in (Halskov and Brodersen, 2015)). The case study we present here is part of a larger project that investigates adaptations of open geospatial data and its uses with and for forced migrants. This type of information is increasingly available, in particular in urban areas, and it can be leveraged to provide different types of services to various user groups.

3.3.3 Context and Refugee Situation in Münster, Germany

The research project takes place in Münster, one of the largest cities in the federal state of North-Rhine Westphalia, Germany. Due to the distribution scheme established in Germany, in 2015 North-Rhine Westphalia received 21.24% of all forced migrants arriving in the country (BAMF, 2015). Among this group of newcomers are many refugees and asylum seekers who are underage. German law requires children from the age of 6 to be in full-time education for a period up to 12 years (varying between German states). This also applies to people seeking asylum as well as those who have been granted refugee status. Due to the massive influx of forced migrants to Germany during the years 2014 to 2016, many schools in North-Rhine

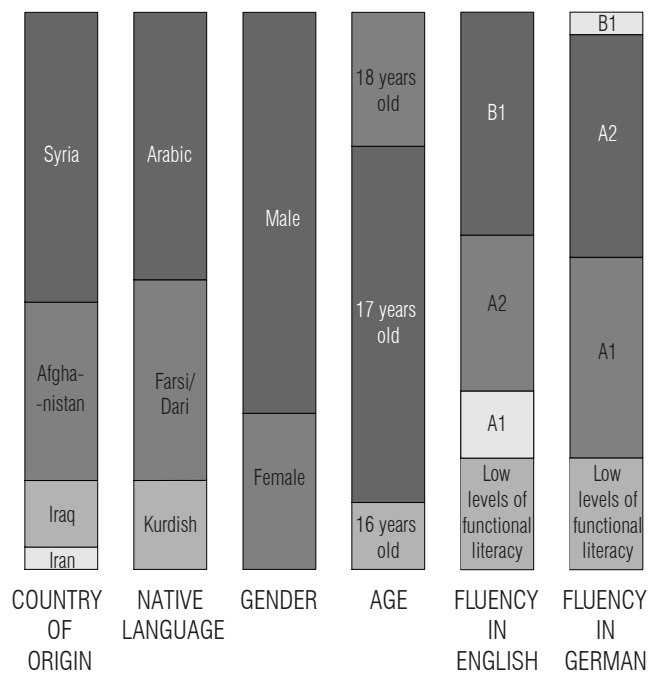


Fig. 3.3: Demographics of the young forced migrants participants.

Westphalia have welcomed a large number of new pupils from among this group. These schools regularly run specific classes targeted at addressing various needs of these new students, e.g., to improve their language skills and to support their social integration process. The case study presented here can be seen as being part of this particular curriculum.

Two groups of students who had enrolled at a vocational school took part in the case study. One group consisted of young forced migrants (YFMs), while the other one was made up of local students who had been living in Münster for a longer period. We conducted five workshops, a field trip and a data processing activity with them during September and October 2016. The group of YFMs (i.e., refugees) had, on average, 25 persons participating in all five workshops. From the workshops with the local students, approximately 20 participants were present in all four sessions in which they were involved, i.e., two workshops, a field trip, and an afterward post-processing data exercise.

The numbers of YFMs taking part in the workshops varied from 18 to 27 participants. Several reasons caused this variation which will be explained further below. The background information given here is based on data of the 25 YFMs participants who were initially registered in the activities and compiled by the school's staff. On average, seven female and 18 male young forced migrants participated in the activities who were registered at the school. The ages of all participants varied between 16 to 18 years old. The countries of origin of the participants were Afghanistan (8 participants), Iran (1 part.), Syria (13 part.), and Iraq (3 part.). Their native languages were Dari/Farsi (9 part.), Arabic (12 part.), and Kurdish (4 part.). Before the workshops, the school staff had provided us with information about the proficiency levels of the participants in English and German. The language levels from the school staff's data followed the classification from the Common European Framework of Reference for Languages (CEF). Regarding English, the proficiency level of the participants were B1 (10 part.), A2 (7 part.), A1 (3 part.). With respect to German, the participants' proficiency levels were B1 (1 part.), A2 (10 part.), and A1 (9 part.) (Figure 3.3). Five participants were considered to have low levels of functional literacy in both English and German languages. The majority of the participants who took part in the activities of this group had been in the city for less than six months. Nonetheless, some participants had been in Münster longer than that and up to 12 months.

Only five out of the original 25 participants were 18 years old and thus able to provide by themselves legal signed consent for participation. For the remaining 20 persons, the consent form to be signed by them and their parents or legal tutors. Due to the particular personal, social, and political situation of many of the individuals from this group of the population, the process of getting proper and informed signed consent forms by the various actors took longer than expected.

As for the group of local students, all participants were between 18 to 23 years old, male, spoke German (native speakers) and English (B2 level) who were enrolled in the IT class of the school, according to the data provided by the school staff. Their involvement in the project was initiated by their IT lead teacher with the intention to engage them in activities related to technology that have a direct social impact.

3.4 Methodological Considerations

3.4.1 Activities Conducted

The initial structure of the activities presented here was sketched based on the experience of the staff members from the school who carried out courses and education projects with YFMs. They acted as informants based on their daily interactions with

the targeted population group. The activities program was complemented with insights from interviews held with adult forced migrants in other scenarios and resulted in the inclusion of additional relevant factors into the workshop design, e.g., the development of a mobile application incorporating geospatial elements. The activities in Stage 1 and Stage 3 that were targeted at YFMs only were modified in their structure and methods based on the results obtained in each session. Since the initial approval given by the school to implement the activities with both groups was given for the development of a mobile application with some geospatial components, the latter featured in several of the activities of the Stage 2-Collaborating.

We chose cooperative learning methods such as workshops as they help participants to gather a broad range of viewpoints and to identify similarities and differences between opinions within the groups. Our goal was to emphasize the role of YFMs as research collaborators (co-researchers). Thus, we divided our work plan for this case study into three stages: 1) brainstorming (workshops No. 1 and No. 2); 2) collaborating (workshops No. 3 and No. 4, and one field trip), and 3) co-designing (one hands-on activity and workshop No. 5). The team of researchers acted as facilitators in all the workshops.

In addition, we selected English as the primary language for all activities. We wanted to work with a common language that reduced the number of intermediaries in the conversation. At the same time, it was expected such common language allowed the majority of actors to express their ideas. Using English as the shared language was possible based on the information provided by the school staff regarding the participants' language skills (Section 3.3), i.e., around the 75% of the YFMs participating had basic to intermediate levels of English. We also provided additional support for German interpretation during the activities if required.

In the following paragraphs, we describe the tasks that participants performed during the different workshops in detail.

Stage 1. Brainstorming (Workshops No.1 and No.2)

The goal of this stage was to obtain an in-depth understanding of the young forced migrants' challenges and needs during the first stages of their (re)settlement in Münster. We designed two sessions with similar questions, where one generated the base for the discussion of the following one. We proposed three to five guiding questions to trigger the exchange of ideas in each of these exercises. 20 to 30 minutes were initially assigned to each question which was written in a simple language. Participants were asked to answer them using keywords or short statements. We created a semi-round table arrangement and located a large-format paper in front

of the discussion group where the questions as well as the participants ideas were added. In both sessions, the facilitators wrote each of the participants' insights regarding one of the questions on sticky notes (Subsection 3.4.2) and attached them to the large paper so that it was visible to all.

We organized two brainstorming workshops. 19 young forced migrants participated in the first one, and around 25 YFMs in the second one. We divided them into two mixed gender groups, i.e., group A: 10 people and group B: 9 people. The first workshop gathered challenges and needs of YFMs when they arrived in Münster. For the second workshop, we created two parallel but separate activities. The activity was similar (in the setup) to the first workshop and collected challenges and needs of this group. The number of participants increased due to new enrollments in the school, as well as the participation of students who were interested but could not show up during the first workshop. The other activity was a focus group conducted with 18 local students who were part of the host community and who were registered in the school's IT course. This group of participants was asked to provide places and events in Münster which they thought from their experience could be of interest for young newcomers arriving in the city. All activities from both workshops 1 and 2 were collected on paper and audio-recorded.

Stage 2. Collaborating (Workshops No.3 and No.4, field trip and data processing activity)

During this stage, we aimed to stimulate collaboration between the YFMs and the local students. Workshop No. 3 had around 44 participants (18 local students and around 26 YFMs). Based on the young forced migrants' needs identified in Stage 1, in this new workshop, the two groups worked together to specify how to address these through the provision of knowledge regarding urban services, events, and places in Münster. We created seven mixed teams, each consisting of YFMs and local students. We facilitated the discussion in the teams using a set of open questions related to these aspects. Once all sides were discussed and they reached a consensus, they reported on the services and places, which could be of used for young forced migrants and the possible ways in the city to access them. This information was again written down on sticky notes and posted on a large-format paper in front of the group. Then, both groups of participants were asked to select one of the defined paths to explore in greater detail, i.e., the one they considered was of great importance for forced migrants when they arrived in the city. They were also encouraged to propose two alternative ways of navigating the selected route. An extra task, to perform after the session, was to explore the chosen route from both directions, and choose one way for the data collection activity. The participants were also presented with spatial concepts to consider during their exploration task and the field work, i.e., referenced places as well as origin, destination, decision, and

confirmation points. The school offered an additional meeting in-between workshops No. 3 and No. 4, for groups, to get together and work on the exploration task. Most local students were present at this meeting, but less than five YFMs went to this session.

During workshop No. 4, the teams presented the results of the task resulting from the previous workshop, and we introduced the field activity. The field work was done with the support of the school's administration and lasted around four hours. We provided each group with a paper form to assist the field data collection. We also proposed different roles for the members of the teams to encourage each person to engage in the various tasks actively, i.e., taking pictures, making annotations, scouting landmarks, as well as defining decision or confirmation points. The panoramic pictures collected during this exercise required an initial post-processing, i.e., selection of images, editing images following current privacy and protection legislation -blurring faces and vehicles' plates-, and a precise indication of referenced places. The post-processing activity was carried out only by the local students during a hands-on session. This decision was taken based on this group already having the required technical skills due to their IT formation. Bringing YFMs to the same level of experience within the time constraints of the work was not feasible. The open-source tool GIMP was used for the post-processing of the panoramic pictures ¹. The geographical data collected can be accessible in .json format on Zenodo (zenodo.org through this DOI: 10.5281/zenodo.997211). An example of the post-processed panoramic images is also available there.

Stage 3. Co-designing (Workshop No.5)

The research team held an exploratory design session for a mobile service for and with the young forced migrants using a series of paper templates to develop initial wireframes of the application. The idea behind this was to use all the insights the YFMs identified about their situation during the Stage 1 of the project to develop a mobile service for their needs. The paper material included a range of icons and templates of smartphones screens. The rationale for developing these wireframes was 1) to gain more insights regarding young forced migrants' preferences and needs with respect to the technological artifact meant to support them upon arrival, 2) to give them greater influence over the mobile tool, and 3) to familiarize them with an easy-to-learn and easy-to-use rapid prototyping technique (paper wireframes). We gave them a series of semi-concrete icons to observe their understanding of these type of elements. We also used these to trigger potential associations between abstract iconographic representations for user interfaces and the YFMs' prior experiences using mobile applications. During this workshop No. 5, we did a debriefing with the

¹<https://www.gimp.org/> (last accessed: January 17, 2017).

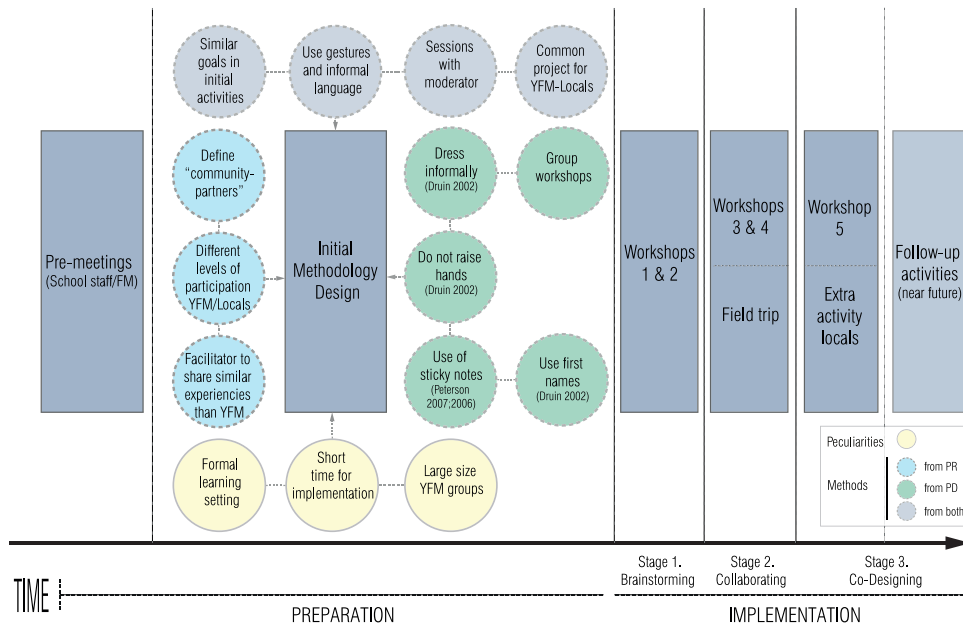


Fig. 3.4: Overview of methods used in the case study with young forced migrants with limitations

collaborators through group discussion and three open questions, and a wrap-up of all the activities.

Lastly, we undertook an additional evaluation using a mixed questionnaire. The questionnaire was used to follow up the open evaluation session part of Workshop No. 5. At this point, we opted for questionnaires instead of interviews due to the researchers' perception that anonymity would increase the probability of honest replies. The second factor for the decision to use questionnaires (and not interviews) for feedback was the YFMs' English language proficiency. The research team felt that the written form would increase the YFMs options to provide detailed feedback, which might not have been possible in face-to-face interviews where they may not be able to express themselves freely. In general, the questionnaire consisted of eight questions in the form of statements and two open questions. The participants were asked to use a Likert scale to indicate their level of agreement with those. The YFMs were also encouraged to participate in follow-up meetings of the research project, e.g., user interface design workshops with a first prototype based on these workshops results. Figure 3.4 shows an overview of the combination of methods that we used.

3.4.2 Elements from Participatory Design

In this Subsection we detail the methods we used in our case study to address the core aspects of PD mentioned in Subsection 3.2.1, as follows:

(1) Promoting diverse participation and democratic decision-making. This point was taken into account when shaping Stage 2. Collaborating. Our targets are various groups of young stakeholders involved in the multiple stages of the forced migration phenomenon in Münster, i.e., young forced migrants and young members of the host community. To first approach both population groups, we searched for a space where we could find clusters of these groups to present the project and to invite them to participate. As mentioned before, we identified clusters for this early iteration of the general research project in a vocational school (Subsection 3.3.3).

Engaging YFMs to participate in the case study can be challenging. Aarhus et al. (2010) mentions that this issue becomes more pronounced when the users belong to disadvantaged groups, in the author's case elderly population. Aarhus et al. (2010)' observations also seem to apply to this study. We considered different aspects and incentives to overcome the challenges of engagement of the vulnerable group involved in the research project. Such elements are:

- *Project presented to the YFMs as an optional and different activity within their regular academic program.* In order to emphasize this "special" condition as a more informal space within a formal learning environment setup, we applied, as presented prior, more cooperative and dynamic techniques such as workshops and spontaneous discussion tables. We hoped that by using fast brainstorming methods we would encourage YFMs to act and communicate among themselves and with us in a more relaxed way similar to how they behave in an informal daily life setting. The objective was for them to do not see us at the same hierarchical level than their teachers at the school.
- *The spaces of collaboration between young forced migrants and members of host community* could spark the interest of the first group by presenting them with a more open setup to have social interactions with the local community in their new city. For the local community, this case study could enable it establish a closer link to a group of population beginning to be part of their community and to explore ways to support this transition. For both groups, in general, these common meeting spaces could represent a step towards an increased social integration dynamic. This might also help to reduce Te Lindert et al. (2008)'s identified YFMs' occasional perception of social exclusion or discrimination.

- *Seeing the activities as a technology-development process* that can be of interest for the participants. The topics of such sessions were related to the technical conceptualization of a mobile application. According to the information provided by the school staff prior the initiation of the case study, several YFMs were initiating searches for internships in several technology-based companies in the city, and it was thus of interest to them to acquire skills related to software development.

We also incorporated additional ways to encourage the presence of multiple voices in the design process and to promote a democratic decision-making process. Some of the proposed strategies were closely related to communication actions such as:

- *Sometimes YFMs can be shy or can feel uncomfortable sharing their ideas out loud and in English.* If we perceived this to be the case in our sessions, we invited them to share their thoughts and opinions in two alternative ways 1) by telling another group member whom they trust – this person would then share it with the facilitator, and 2) they could write it on the sticky notes by themselves whenever they felt ready to do so.
- *The communication of a diversity of ideas in a short time was addressed with sticky notes.* Peterson and Barron (2006) observed, that sticky notes are useful in checking understanding, as well as in grouping and sorting ideas. Sticky notes also provide "visual evidence of a shared achievement that shows that different ideas have been acknowledged" (Peterson and Barron, 2007). We specifically intended to explore the promise of sticky notes to promote "fast, engaging, and diverse" communication among and with YFMs participants.

We included a facilitator who moderates the sessions and records the YFMs' inputs. The facilitators could enhance YFMs' participation as some of them might not feel comfortable enough writing in English, i.e., due to a low proficiency in the language or low literacy levels. Facilitators are also able to avoid discussions getting sidetracked and to draw the focus back to the issue at hand. This may be of particular relevance when dealing with a large group of adolescent people who may find it harder to stay focused on one thing and interested over extended periods of time.

(2) *Mutual learning, testing premises, and generating new concepts.* As stated in Section 3.3, we decided to use group workshops (Muller and Druin, 2012; Kensing and Madsen, 1992; Greenbaum, 1991) as the main strategy for the case study with young forced migrants in a school setting. Greenbaum (1991) defined group



Fig. 3.5: Images of Workshop No. 3 – joint activity between young forced migrants and local students

workshops as agents that promote people’s participation by making them feel more capable of expressing their opinions and relating to others experiences based on similar challenges and uses. The workshops contributed to mutual learning as part of the PD process by enhancing the communication dynamics and the spaces for interactions between multiple actors (Figure 3.6). For the aforementioned purpose the research team proposed the following approaches:

- *The facilitators avoided "technocentric" and complex language* in the PD process as suggested by Greenbaum (1991). This is a key aspect, particularly for the group of YFMs due to their ages as well as their educational and cultural background.
- *Joint project between young forced migrants, host community, and researchers.* In this research space, described in Subsection 3.4.1, we proposed exercises to promote the exchange of experiences, needs, and ideas as well as exchange of social interactions among young forced migrants, the host community participants, and the group of facilitators. We provided an initial common topic to work on: the conceptualization of a mobile application to support YFMs upon arrival and during their first stages of (re)settlement in Münster. While this topic was transformed and adapted according to the inputs from the sessions, the overall idea was to address the difficulties YFMs face on a daily basis.

To test premises and to generate new concepts as a result from the mutual learning and the democratic process, we consider the following elements:

- *Workshops as the space to introduce new and different actions* (Muller and Druin, 2012). Muller and Druin (2012) state that this characteristic allows participants to locate themselves in situations which are not familiar for them to carry out processes of collective negotiation to have a shared knowledge

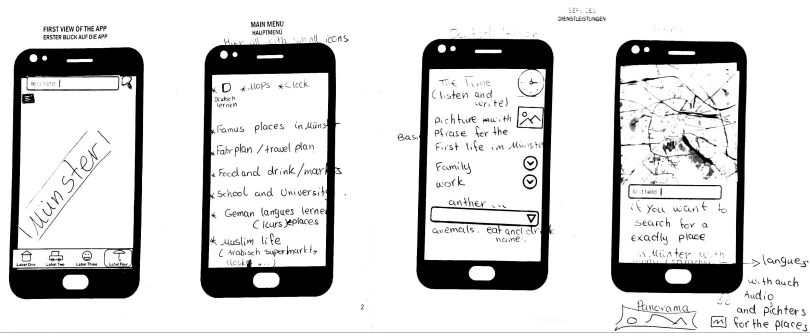


Fig. 3.6: Image of a paper-based wireframe created by one of the participants of the YFMs group

alongside a commonly designed artifact. Each of the workshops included actions which indirectly or directly lead towards conceptualizing the previously defined technology-tool to support YFMs to access and navigate information about spaces and services in the new city easily. In the first session, we searched for aspects related to YFMs way of life and context to re-shape the goal of the general research project, the case study, and the tool. The use of sticky notes permitted to introduce a fast and creative dynamic for YFMs to collect a large set of diverse ideas. The overall outcomes of these sessions favored the conditions to generate novel ideas and concepts to the more general research project goal.

Additionally, in workshop No. 5, we introduced materials to YFMs to develop wireframes with them. By doing so, our participants could see an initial summary and materialization of their ideas which were discussed in previous activities. Through the wireframes, we intended to engage all parties in the design process actively and endorse adequate knowledge procurement (Muller and Kuhn, 1993) for the participants with no previous design and development background. Wireframes serve this purpose well since they are easy to build. They also facilitate the detection of issues in the design and can be used to address these issues before the mobile tool is fully built (Nesset and Large, 2004). In addition, this type of low-fidelity representation generates a “mutual learning process” where facilitators (e.g., researchers, technicians, designers) and users have an equal say regarding the final result (Muller and Druin, 2012; Greenbaum, 1993; Nesset and Large, 2004) (Figure 3.5).

(3) *Iterative conditions.* The iterative, flexible and general character of PD promotes the idea of children and adolescents as peer co-designers (Druin, 2002; Nesset and Large, 2004). These characteristics make PD a highly suitable approach to elaborate design actions with young population (Nesset and Large, 2004). As stated in Section 3.4.1, we planned a series of continuous activities to be executed

over a month-long period, e.g., workshops, field trips, group work sessions. The initial stages (Stage No.1-Brainstorming and Stage No.2-Collaborating) had several actions that followed a similar structure but each had slightly different goals. In every one of the sessions, we occasionally referred back to answers and topics that our collaborators had provided in previous activities. The idea behind this was to generate compelling and critical ways of knowledge acquisition (Muller and Kuhn, 1993) in the research group, i.e., facilitators and collaborators. The co-designed wireframes that were created by YFMs constituted a common base that can serve as a starting point for further development in future workshops, i.e., with respect to user interface (UI) and content design.

3.4.3 Elements from Participatory Research

As for the part of our case study rooted in the Participatory Research approach, we considered the following elements of PR as defined by Bergold and Thomas (2012) and von Unger (2014).

(1) Participatory research demands democracy and different levels of participation. We put great emphasis on collaborating with the YFMs democratically. We considered them as co-researchers who equally contribute to diverse aspects of the project, e.g., research questions, objectives, and outcomes. However, the co-researchers were not expected to participate fully in every stage of the research, i.e., in the sense of levels 6 to 8 defined in M. Wright et al. (2010)'s "stage model of participation" (M. Wright et al., 2010) (Figure 3.1). Based on our observations of the participants' behavior during the activities, we considered it to be neither sensible nor ethical to ask recently fled and possible traumatized young population at school age to increase their workload beyond their regular day-to-day activities. To fully involve them in data analysis, they would have needed to spend considerable time on studying and applying various analysis methods. As von Unger (2014) stresses, the level of participation in every stage has to be adapted to the circumstances. Thus, high levels of participation should not be pursued at any cost. Nevertheless, YFMs had the power to make high-impact decisions in most of the other stages and contributed to those with high levels of participation (M. Wright et al. (2010)'s model - levels 7 and 8).

In the case study presented here, the first stage of the workshops (brainstorming) was intended to facilitate a discussion between the co-researchers and researchers regarding the former group's situation. The results would have an impact not only on the final design of the artifact but also on the research question and the research goals as well. This is consistent with the characteristics of M. Wright et al. (2010)'s participation model level 6-codetermination. It also helped to establish mutual

appreciation and trust among the actors and to understand the other groups' point of view.

The following stage of data collection is nearly fully transferred to the co-researchers, i.e., addressing the conditions of the level 7-partly authorized to make decisions of M. Wright et al. (2010)'s participation model. They are to define the routes and relevant points of interest in those. The premise of the case study was that a successful engagement of YFMs in the data collection stage substantially determined the initial content and functionality of the mobile tool concept. We referenced the data collection activity in Section 3.3 as part of the field trip planned with their local teammates during stage No. 2- Collaborating. Here, our research team stepped back and took on the role of assisting consultants.

Moreover, we expected that with the assistance of the researchers, the co-researchers would create paper-based wireframes of the mobile tool, discuss what is relevant to them, and highlight what is still missing or what needs to be added. In this state we were congruent with M. Wright et al. (2010)'s level 8- power to make decisions- of participation. The objective was to interpret the data in a "reflection activity" done between researchers and co-researchers to include the largest variety of ideas from YFMs (stage No.3-Co-designing). When it comes to the biggest part of data analysis and interpretation, the researchers took again the lead, but discussed their findings with the co-researchers in deliberation meetings, i.e., M. Wright et al. (2010)'s level 4-consultation.

For the most part, during all the sessions each idea was appreciated and written down, no contribution was assessed, and the participants were invited to express their opinion regardless of its actual feasibility. This attitude of collaboration was maintained throughout the whole research process and meets the requirement of democracy defined by Bergold and Thomas (2012). Furthermore, we believe that an important aspect of democracy is to let the participants decide freely to which extent they wanted to participate, i.e., at a level at which they felt comfortable.

(2) *Creating a "safe space"*. In the planning of the workshop, we put great emphasis on this aspect for the participants. Therefore, we had to address some concerns. Firstly, we considered that some young forced migrants might have feared that the ideas or comments they expressed during the sessions could result in a negative assessment of them by their school teacher. We decided then to exclude all regular teachers from the activities to generate a space with a limited amount of external factors to help YFMs to feel less inhibited to utter their opinions and act freely. Nonetheless, we invited their young tutors (whom they seemed to feel comfortable with) to support the communication process as German interpreters. Secondly, we thought it possible that our collaborators feared facilitators would

report their opinions to the academic staff. To tackle this, we decided that facilitators would repeatedly stress to the participants that all the work done in the workshop, as well as the data collected with the evaluation questionnaire, are fully anonymized and impossible to trace back to the person who provided it. We also communicated frequently to the collaborators that no action or statement given to us by them would have negative consequences for them. During the workshops and in the discussions, the researchers gave positive feedback to every participant's statement and continuously encouraged constructive criticism towards the facilitators role or actions . Thirdly, the majority of the feedback from the co-researchers was collected on a collective instead of an individual basis so that no person would feel exposed. Only the questionnaires were filled in by each individual. However, those did not ask for any personal information from the participants that would have enabled the identification of the person who had provided the answers. Finally, cultural challenges are to be faced with utmost respect and sensitivity. For example, a female participant from the group of young forced migrants group expressed discomfort being in the team we preassigned her to. As facilitators, we decided to address her concerns by proposing her to create her team freely. She and other friends then exchanged their male young forced migrants group members for female representatives, and they joined their groups to cooperate with the local collaborators. They expressed to be comfortable working with the young male members of the host community since, according to the participant, they do not share their cultural background.

(3) *Defining the "community" and "empowerment"*. Young forced migrants are defined as a vulnerable group due to their general context and characteristics. They have limited opportunities to make their voices heard in the host community and in society in general. Thus, we put much emphasis on including them as co-researchers of this study – specifically as "community-partners" (von Unger, 2012). We targeted forced migrants at school age to collaborate with us. Most in this group of co-researchers had arrived in Münster less than six months ago and were thus still facing the process of familiarizing themselves with the new city. The project sought to empower them to make a difference in their everyday life and improve the situation of other YFMs in a similar situation. We planned to accomplish this goal in two ways. First, by fostering competencies in and through the workshops; and second, by handing over the responsibility of the decision-making to them for several stages of the research process and the design.

(5) *Dual objective*. The research approach in this study is consistent with the dual objective of PR as defined by von Unger (2014) (Subsection 3.2.2). The goal of the methods proposed in the study is on the one hand to gain knowledge about young forced migrants' living conditions (e.g., experiences, challenges, needs) and to design an artifact that responds to their needs or the ones from future population

groups in the same situation. While jointly designing a product is also a core element of PD, the second objective, goes beyond the aim of PD. By including YFMs in high-impact research decisions and handing over responsibility to them, we targeted three core competencies of sustainable development. We will discuss the aspect of fostering sustainable competencies in more detail in Subsection 3.6.2.

3.4.4 Ethical Considerations

Existing ethical recommendations from projects specifically related to carrying out research with migrants (Mahalingam and Rabelo, 2013; Hernandez et al., 2013; Nguyen et al., 2013), as well as from HCI research ethics in general (Lazar et al., 2010)) are relevant to the current case study. Both sets of recommendations highlight the importance of generating safe processes where informed consent procedures are implemented, along with abundant communication about the case study itself. Moreover, these previous works point out that working with young forced migrants requires a step-by-step process to gain the trust of the community (Mahalingam and Rabelo, 2013; Hernandez et al., 2013; Nguyen et al., 2013). In this context, it is necessary to emphasize the role of the researcher as a facilitator while aiming to strike a balance between what she/he represents and her/his potential impact while working with YFMs. Additionally, the authors mentioned the need to ensure that collaborators were not at risk while participating in the research.

Regarding the study procedures, our methods considered different stages of creating spaces to make the YFMs fully aware of the project. The staff of the school and the facilitators provided the participants on several occasions with all the details of the project, its activities, and its requirements. These sessions were held in the shared languages in which the participants and researchers were proficient with, English and German. In every follow-up workshop and activity, due to the formal education setup in which the activities were carried out, the facilitators reminded the participants that if they did not want to be part of the session, they could freely decide not to participate without fear of penalization neither by the school nor the facilitators. In each session, the participants were repeatedly encouraged to voice any concern or question about the project.

With respect to consent, we wanted to have the agreement of all the actors and institutions which were involved in this project. Therefore, we first asked the school for their consent to develop activities with YFMs and the young local students. We explained and built a detailed plan of the diverse activities with the school staff. Additionally, in the first informative sessions, consent forms were described and distributed in English and German to the participants from the YFMs group and young members of the host community. They were asked to take the consent forms

CHALLENGES	HETEROGENEITY & HISTORY OF IMMIGRANT POPULATION	RESEARCHER LENS, BIAS & INFLUENCE	RESEARCH PRAGMATICS (e.g. consent) (Nguyen et al. 2013)	
	SUB-ASPECTS	Diverse Experience (between and within-groups)	Not fall in ethnic labeling	Trust of the Community
Background (e.g. cultural, educational)		Understanding of Cultural Practices (e.g. mental representation and situated practice)	Ensure That Participants Are Not at Risk	Thoroughly Evaluate the Linguistic Translation of Instruments and Protocols (interact in their native language)
Linguistic Differences		Avoid The Cultural Deficit Model	Support The Participants Experiences and Sociocultural Viewpoints	Informed Consent Procedures (e.g. level of education, sociocultural context)
Migration history		Avoid The Use of Ethnophaulisms Privilege Awareness		
ADDRESSING THE CHALLENGES	Open Mindedness	Intersectional Framework	Translations Into Their Native Languages of Instruments & Protocols (e.g. social and cultural translations as well)	
	Use of Interpreters	Phenomenological Approaches	Immigrant as Research Collaborator	
	Background Questions	Ensure Understanding of Research Procedures (Mahalingam et al. 2013)	Triangulation in the Study Design (Hernández et al. 2013)	
	(Nguyen et al. 2013)			

Fig. 3.7: Ethical considerations with immigrant population based on Hernandez et al. (2013) and Nguyen et al. (2013)

to their legal tutors. In this procedure, they were encouraged to mention to the legal tutors that if they have any reserve, they should contact the school or the researchers. In case the legal tutors contacted the school, their concern would be redirected to the research team and would be addressed by them directly. Several students enrolled in the school with a forced migration background were defined as unaccompanied minors. Thus, the German government had assigned to them, upon arrival, legal tutors. Such situation required special measures and strategies which are explained in Section 3.5 (Figure 3.7).

3.5 Results

This section presents the challenges and the opportunities we identified while using a combination of PD and PR strategies with young forced migrants during the different activities presented earlier. The section introduces, 1) results from the analysis of categorical data (frequency distribution analysis) of the Likert scale-based questions from the evaluation questionnaire; and 2) outcomes from a qualitative analysis of the observations of the facilitators and the participants during the sessions. The latter also includes answers by both collaborators groups (21 YFMs and 20 young members of the host community) to the open questions in the evaluation questionnaires. The questionnaire contained inquiries related to the activities, facilitators, co-designed mobile tool, and joint sessions. The participants' quotes exemplified in this paper are literal transcriptions of their statements in the original language they expressed

those in.² To present the outcomes, we use a series of acronyms: YFM_P# for quotes from specific young forced migrants, LP# for the ones from local participants, S# to reference the inquiries done particularly for YFMs and Q# for the questions directed to the host community members.

3.5.1 Challenges of Participatory Design and Participatory Research

The challenges present in the study were mainly related to the role of language fluency in the research activities, the duration of each of the actions, and the engagement of the young people from host community at the school. The engagement of the host community participants is an important aspect which can facilitate (or hamper) YFMs' social integration with their new community. In general, all these conditions impacted both participatory approaches (PD and PR) in their communication and organizational aspects. More specifically, we identified the following challenges:

Need for further language assistance during the activities. From 21 YFMs who answered the evaluation questionnaire, 76.19% thought that the activities were limited because of language (S10). While answering the open questions, several YFMs emphasized the need of involving translators or interpreters in future endeavours. An opinion which was also brought up by the collaborators during the debriefing session in workshop No. 5. For example, YFM_P2 mentioned on the questionnaire,

"Wir brauchen die unterhaltung zwischen zwei personen mit verschiedener sprachen."

Translation: "We need communication between two people with different languages."

Accordingly, YFMs stressed the need to consider the language challenge in future iterations of the activities (Q9).

"Communicate with the refugees because the fewest want to talk." (LP11)

"Create groups with people which have different language skills." (LP5)

Likewise, local participants who were part of three sessions of the study (two workshops and a field trip) reported communication difficulties when interacting with the YFMs participants. 65% of them highlighted this issue as the most significant challenge through their open questions' answers. They identified as the primary

² For further information on the data collected by this study please contact the author's of this article.

factor the limited proficiency in English or German (Q8) of the YFMs collaborators and its impact on activities dynamics due to the organization of the groups.

Despite also noting this challenge, the facilitators in their observations manifested that the low proficiency of the facilitators in Arabic, Farsi/Dari, and Urdu, as well as the basic to intermediate knowledge of English of the YFMs collaborators, impacted only partially the flow of the sessions with the YFMs participants. The facilitators highlighted the use of sticky notes as a means to diminish the language proficiency gap and its positive impact in the dialog between YFMs and facilitators.

Limited time for the implementation of the activities. Some of the YFMs collaborators singled out the time constraints of the activities as one of the challenges. YFM_P12, for example, made the following statement while referring to aspects that could improve future workshops,

"We can try more, and we must have a lot of time for that, and we can practice together like a team. We should listen to other people's idea and speak about that."

Also, YFM_P14 indicated,

"I think we need more time, more practice and more relationship with others to work with this app."

Due to the temporal extent of this study (i.e., the sessions lasted a month) and its initial goal, at the end of the month, the mobile tool was still left in its preliminary design stage regarding its content, name, user interface and data visualization. We also recognize YFMs relied heavily on their acquired knowledge and on their own smartphones' user interfaces when imagining a tool for them. For some of the YFMs, it was difficult to come up with new ideas for the wireframes from this acquired knowledge. Thus, they reproduced previous mobile applications they had used or mixed representations, i.e., combined UI or content from a mobile application they knew with the one they are imagining. They provided ideas about content and its visualization as well as some first indications concerning user interface design. Their use of these elements in the wireframes varied. Participants combined sketches with the given paper icons, glue, and paper-based smartphones silhouettes to visualize these ideas.

Engaging local participants. The participation of locals during the execution of the case study was high. 20 local participants answered the evaluation questionnaire. Despite their high involvement, when asked about their opinion related to the

activities and their future engagement in the development of the tool for YFMs their answers were not conclusive. For example, the results of the first closed-statement (Q1) showed that 50% of the locals found interesting to participate in the workshops with the group of YFMs (15% of this group strongly agreed, and 35% agreed with it). However, 30% neither agreed nor disagreed with the previous statement, and the remaining 20% did not find the activities interesting. Similar results were obtained for the statement (Q2) related to whether the local students thought that the workshops with young forced migrants were a good opportunity to establish relations with newcomers in the city. 50% of the young locals responded positively (10% strongly agreed and 40% agreed), 35% neither agreed nor disagreed with the statement, and 15% did not find these activities a good opportunity to relate with YFMs. Moreover, when asked about how they felt while collaborating with the young forced migrants in several activities (Q4), 55% percent answered that they were either highly comfortable (15%) or just comfortable (40%) during the sessions. Additionally, 30% stated that they felt neither uncomfortable nor comfortable during the activities, and the remaining 15% mentioned that they were either uncomfortable (10%) or highly uncomfortable (5%).

More importantly, when asked about their willingness to continue participating in these types of activities in which they have the opportunity to relate to newcomers, particularly YFMs (Q5), only 25% of them agreed with the statement, while 45 % said they neither disagree nor agree with it. The remaining 30% mentioned that they disagreed with this sentence (20%) or they strongly disagreed (10%). Also, only 20% of the local students are interested in continuing assisting to develop the mobile tool for forced migrants in the city (Q7) (5% strongly agreed, and the 15% agreed), 45% neither disagreed nor agreed with the statement, and the other 35% did not have any interest in continuing providing help to develop the app (25% strongly disagreed, and 10% disagreed). These insights and outcomes show the need to adjust PD and PR strategies to work more efficiently with young forced migrants and host communities together in a HCI-related project (Section 3.5).

Effective communication on how the data collected by and about YFMs was managed. This aspect emerged from the observations by the facilitators about the process. One of the core aspects defined in Subsection 3.4.3) was the relevancy of anonymization of information as a factor to promote "safe space." In this regard, the facilitators identified some difficulties when they detailed the role of anonymization and its relevancy to and for YFMs. One example of this issue occurred during the implementation of the evaluation questionnaire where around three to five participants asked if they needed to add their name to the assessment form despite the explanations given beforehand by the facilitators. In the cases where the collaborators wrote their personal information in the evaluation forms, it was erased immediately

afterward by the facilitators. This aspect thus requires further analysis and close attention in future iterations of the project.

3.5.2 Opportunities of Participatory Design and Participatory Research

A set of opportunities were identified, mainly by young forced migrants and facilitators during the activities considering the results from the evaluation questionnaire.

Creation of a "safe space". This principle is promoted explicitly by PR. We assessed primarily two aspects: 1) the opinion of the YFMs collaborators over the whole activity, and 2) the communication aspects. Regarding the first point, the evaluation questionnaires revealed that 95.2% of the YFMs participants were highly comfortable (61.9%) or comfortable (33.3%) with the facilitators during the activities (S1). Only 4.76% of the participants mentioned that they felt uncomfortable. For the joint sessions with the local students, 85.71% of young forced migrants collaborators expressed they felt very pleasant (28.57%) or just pleasant (57.14%) during the activities (S8).

As for communication dynamics during the activities, the outcomes obtained from the questionnaire suggested that 71.43% of the YFMs collaborators felt that the facilitators listened to their ideas. In contrast, 19.04% of this group of co-researchers did not feel the facilitators listened to what they said (S2). The remaining 9.53% were neutral with respect to this statement. Finally, 95.24% of the YFMs (57.14% strongly agreed, and 38.10% agreed) considered these types of actions as a good opportunity to communicate and relate to the local students (S9).

Overall, the observations from the facilitators and the YFMs collaborators match the results obtained through the evaluation questionnaires. They showed a high positive perception from YFMs towards the activities held with the locals. When asked during the debriefing session if they would be interested in continuing those type of exchanges in future iterations, the majority of them answered positively.

Engagement of young forced migrants. 95.24% (42.86% strongly agreed, and 52.38% agreed) of YFMs questioned expressed their current, and future contributions could make a positive difference in the outcome of the overall research project (S7). Moreover, some participants specified that these activities present the opportunity to work as a team. They felt that teamwork should to be emphasized in future iterations of the case study (S3). Concerning this, YFM_P2 stated:

"Wir müssen regelmäßig uns treffen und unsere Meinung[en] teilen, dass wir zusammen eine gute meinung erreichen."

Translation: "We have to meet regularly and share our opinion because together we have a good opinion."

During the sessions, the facilitators observed collaboration dynamics (teamwork) among some mini-groups of participants, i.e., initiated, in several cases, by participants with low levels of functional literacy, or limited proficiency in English or German languages. In each session, at least two of the YFMs collaborators actively sought support from the group and paired up with someone from the same group who they trust. Such action reinforced their participation by asking their team mates how to say a certain thing and repeating it by themselves, as well as by using gestures to express their ideas.

On the subject of the future iterations of the activities, 85.72% (71.43% strongly agreed, and 14.29% agree) stated that they are interested in continuing providing ideas to develop the mobile tool, the remaining 24.38% was neutral about the statement (S6).

One of the key strategies for engagement, as mentioned in Subsection 3.4.2 was the use of sticky notes. Running a focus group in the traditional way would have been challenging since some YFMs were neither fully proficient in English nor in German. The facilitators observed that the decision of using sticky notes as a recording tool not only helped to document each participant's comments but motivated several of them to participate actively in the sessions once they realized all their ideas were being recorded. The positive effect of sticky notes in focus groups on participants' engagement was also observed in previous work (Peterson and Barron, 2007; Peterson and Barron, 2006). Since there is no systematic comparison of "focus groups with sticky notes" and "focus groups without sticky notes," further work is needed to quantify this effect fully. Our experience is positive, but further in-depth studies are required to investigate the difference in terms of participant engagement (i.e., how comfortable do they feel expressing their opinion?), and communication success (i.e., how much do they say what they intended to say?).

People-driven adaptation of the research goals. Applying participatory research (PR) results in modifications of research goals, research questions and, ultimately, practices. The research team used continuous workshops as the primary strategy to modify the general project research scheme. This strategy allowed us to gather a number of diverse insights into YFMs's needs and experiences. As a result of this participatory process, we modified future iterations of the case study to adjust the overall research framework (question, hypothesis, and objectives) based on the YFMs' recommendations.

For instance, one of the primary research goals prior to initiating the workshops was, based on previous insights from the larger research project, to find ways to adapt open geospatial information, particularly for navigation, to strengthen the spatial familiarization (Gale et al., 1990) via smartphones of YFMs after arriving at Münster. During the workshops 1, 2, and 5, the group of YFMs mentioned several relevant additional aspects. For example, some stated they would like to have a way to talk more with other young locals *"to find girlfriends," "to talk with German students in their school," "to ask other for information"* and *"to arrange speaking and conversations."* Also, they stated that they would like to easily access *"information of the city"* including places such as *"hospitals, clubs/bars, libraries, sports centers"*, and cultural events such as *"festivals and holidays"*. In workshop 1, the YFMs collaborators also highlighted activities such as *"to learn German"* and *"to know English"* as primary elements during the first three months in Münster. Therefore, multiple discussions and mutual mirroring of the others' perspectives occurred. As a consequence, researchers and co-researchers adapted the research question to consider the inclusion of activities and augmented features related to education, language, and cultural and social content to complement the tool's geospatial core functionality.

As stated previously by von Unger (2014) and the International Participatory Research Network (Coghlan and Brydon-Miller, 2014) PR projects should push for the inclusion of participants at all stages of the investigation as far as is sensible and as long as it is fruitful to do so. Overall, the facilitators observed that during the implementation of our case study some stages were dominated by the co-researchers and profited from their expertise (e.g., defining the problem and data collection) while other stages of the research were more guided by the researchers, e.g., data analysis and interpretation (Section 4.2). Following the principles of PR, the authors prioritized transferring responsibility to the co-researchers while not overwhelming them with levels of participation they felt not comfortable with. Given the fact that a large number of participants stated they were feeling comfortable and felt their voices were heard by the facilitators, we are confident there was a beneficial equilibrium of creating a "safe space" on the one side and handing over the responsibility of the research project on the other.

Potential impact of the co-designed mobile tool for the young forced migrants community. 90.47% of YFMs (33.33% strongly agreed, and 57.14% agreed) indicated during the evaluation questionnaire that the co-designed mobile solution could be useful for them (S4). 85.72% of the total collaborators (38.10% strongly agreed, and 47.62% agreed) expressed that it could also be useful for other forced migrants in Münster (S5). This indicates a high probability to have a positive impact with the proposed tool to aid YFMs arriving in foreign urban environments. The aforementioned technology-related tool needs to include the additional features

mentioned previously to increase the chances of it having a positive impact in the selected community.

Furthermore, from a product design perspective, the collaborators identified other key elements for the development of the mobile tool. Some examples of these features are the use of audio output, the presence of highly graphical interfaces ("*pictures and icons*", "*representing places with pictures*"), and accessible offline content (i.e., the app should work well "*without Internet*", "*maps that you can use with no Internet*"). According to them, these elements can answer their specific needs (usability and practicality) while they are familiarizing themselves with their new environment.

3.5.3 Limitations of the Case Study

Though our case study involved a substantial number of participants and included several workshops over the course of several weeks, it was also subject to a number of limitations. The following paragraphs briefly summarize some key limitations.

Short duration and limited amount of participants of the case study. As described previously, the whole case study lasted a month. During this period, the research team made progress regarding the adjustment of the research strategies and frameworks used. Also, competencies were promoted in the participants, and a first conceptualization of the final artifact was completed. However, due to the limited amount of time, we suggested further iterations of the study. This will allow for improving the understanding of the forced migrants' context, the conceptualization of the content and user interface of the artifact, as well as its full implementation. A longer case study can also facilitate the search for creative and dynamic ways enabling the full participation of YFMs in further research stages, i.e., data analysis, and reporting on the results. In combination with larger samples of participants, this would also provide results that can be more readily extended to other HCI studies.

Activities ran in a formal educational setting (school). The school in which we held the study is a feasible environment to approach young participants (forced migrants and host community). The formal educational setup had groups of participants looking for exciting activities to join, which complement the school's standard dynamics (daily routine, class assistance, teacher-student relation) and curriculum. We created spaces in which we intended to encourage active participation and flexible dynamics, and we hoped these would diminish the possible power asymmetry between the diverse actors. Nevertheless, further studies need to be done regarding what impact formal educational setups with hierarchical structure might have on the participants' dynamics and feedback in participatory activities.

Constant addition of young forced migrants in the activities. As stated in previous sections, the number of participants varied from activity to activity. Two main factors influenced this: YFMs' irregular attendance to school and the influx of newly enrolled students with forced migration background in the school. Strictly regulating the number of the participants to each of the workshops throughout the whole study was beyond the researchers' control. At a methods level, this meant we did not conduct two workshops with exactly the same number of participants. As a consequence some situations arose, where large groups had to be managed by few facilitators present during the workshops. This meant that the dynamics generated had to be quickly adapted "on-site" by re-arranging the configuration of the physical space to guarantee that the facilitator could be seen at all times, and to generate a setup that balanced the "power" differences among all groups.

Verbal consent granted by all participants but some signed consent forms were gathered only after the start of the study. Previously, we mentioned several of the YFMs participants were unaccompanied minors who were assigned legal tutors upon arrival in Münster. Various legal guardians had several YFMs under their care. Due to these conditions, the information procedure and the properly granted consent (through consent forms) delayed the start of the case study for some weeks. The activities began when we had an official permission from the school along with granted and recorded verbal consent from all participants involved in the activities. By that moment more than the 80% of the participants had signed consent forms. Nevertheless, the remaining consent forms from underage YFMs required more time and were signed over the following weeks.

No follow-up interviews after the evaluation questionnaires were done. In Section 3.4.1 we explained the reasons why we opted for one resource instead of the other as an assessment and follow-up mechanism. Questionnaires, by guaranteeing anonymity, seemed to provide us with a larger collection of clear and straight opinions from the collaborators about the activities, the dynamics, and the methodology implemented. We recognize follow-up interviews with both group participants would have potentially led to deeper insights into aspects such as why one-fifth of the local participants were not interested in follow-up activities while a high number of YFMs were. Nonetheless, it is possible we would not have been able to identify this differentiation in interests among the two groups, regarding future activities if we had done interviews instead. Aspects such as the participants' age along with the influence of the formal school setting could have prevented them from giving negative or less positive opinions in a one-on-one conversation. In that sense, we opted to prioritize the creation of a "safe space" and to lower the barriers between all involved parties, e.g., via the use of sticky notes to overcome low language proficiency.

3.6 Lessons Learned

From the results reported in the previous section, we can draw a number of lessons which are relevant for future HCI projects applying a combination of participatory research (PR) and participatory design (PD) processes with young forced migrants (YFMs). These lessons should be examined in the light of the peculiarities and limitations of this case study (Section 3.5) and in the context of the implementation of these approaches with YFMs communities. Two main groups of lessons learned were identified 1) adaptations concerning PD+PR practices, and 2) reflections on the combination of PD+PR at a theoretical level.

3.6.1 Lessons Learned Regarding PD+PR Practices

Four main lessons learned emerged from our case study related to PD+PR practices. These elements are defined as follows:

(1) Ensuring a "safe space" throughout the participatory process, particularly while working with young forced migrants in a school setting. Our results indicate that the majority of young forced migrants felt their voices were heard during the activities we conducted. Based on our experience with the case study, we propose two recommendations. The first one is to ensure that YFMs' co-researchers are being made comfortable during the stages of research and design processes in which they are being involved (e.g., initial data collection, data analysis, product design, implementation of results). This can enhance the exchanges between the researchers and the YFMs significantly. Our second recommendation is to create activities dedicated to providing YFMs with a clear understanding of how the general and personal data will be managed and processed by the project. In particular, the role of anonymization should be made very clear. The main lessons learned regarding the "safe space" have specific relevance to the PR objectives in terms of:

- *Addressing YFMs' fear of negative repercussions while providing feedback in a school setting.* As stated above, we decided against inviting teachers from the school to participate in the activities. On several occasions, we had to ask teachers to leave the space reserved for the workshops prior to starting them. The purpose of this action was to create a more informal and free environment, which seemed to have encouraged YFMs to participate more. It also served as a first step towards promoting the balance of roles and power levels among researchers and co-researchers.
- *Fostering collective dynamics to encourage the participation of YFMs, instead of resorting to methods focused on the individual.* We implemented this strategy

from the beginning of the case study. It was an effective way for YFMs to participate and facilitates dialogues about their lives' contexts as well as their needs and challenges when arriving in a new city. The size of groups in this study was quite large, i.e., workshop no. 1 had around 19 participants in total, whom we split into two groups of ten and nine YFMs each. The remaining activities had about 25 participants.

The results of our study indicate that our methods generated intermediate to high levels of engagement when used with large groups of YFMs. It provided our YFMs co-researchers with more decision-making power during the various stages of the research. According to PR, collaborators should be able to operate on high levels of participation and contribute as equal partners during all research stages. Ideally, they should also be equally responsible regarding the decisions on re-calibration. However, further involvement of co-researchers, especially at high levels of participation, should be voluntary (not "prescribed participation" (Mayrberger, 2012)). In other words, researchers should not seek for YFMs to participate at any cost while disregarding their wishes, feelings, and their particular situation. Especially when conducting PR with vulnerable groups such as YFMs, future iterations should pay close attention to the fact that co-researchers might feel overwhelmed by too much pressure to participate at high levels (as observed by M. Wright et al. (2010)). von Unger (2014) suggests that not forcing this requirement on the co-researchers can ensure genuine democracy, and it can enable them to voice their opinions comfortably.

- *Reducing the facilitators' hierarchy in large-sized groups of YFMs.* This contributed to building trust between the various parties. Also, it is likely to have contributed to the high percentage of YFMs feeling comfortable with the facilitators during the activities. A key example is the facilitators' introduction to the group and their request to be called by the first name, as suggested by Druin (2002). It was followed by the facilitators providing a leveling ground by sharing personal experiences related to the topic of the research with the collaborators, e.g., having a migration background and struggling with new environments. It helped in our particular case that all facilitators had stories as newcomers in Münster, which seemed to encourage the co-researchers to connect with them more easily. Moreover, in large teams, the collaborators' feelings of approachability towards facilitators were increased significantly due to facilitators' use of creative ways of communication (such as visual aids) when interacting with YFMs (even when an interpreter was at hand). Furthermore, we had positive experiences following Druin (2002)'s suggestions, related to the informal dress code for facilitators, to use the collaborators' first names, and not to require hands to be raised by the collaborators during the

activities. Those strategies seemed to increase the feelings of empathy and approachability.

- *Prolonging the duration of iterations for the PR and PD processes with YFMs.* As mentioned in the Subsection 3.5.1, the relatively short duration of the study limited the project's effectiveness for balancing the roles among the diverse stakeholders. Holone and Herstad (2013) suggested that increasing the time available during the participatory design activities would allow the less experienced group of collaborators to feel comfortable and gain more confidence in their roles as co-designers. In our opinion, this also applies to the co-researchers role. Increasing the time could further improve YFMs' teamwork skills while building trust relations between them and other parties, which ultimately increases the opportunities for obtaining more tailored and appropriate research questions and goals. These, in turn, can lead to more efficient results regarding the research product alongside a better adjustment of the general framework to YFMs' specific needs. Based on our experience in the case study, a month of research activities was not sufficient. We recommend to allocate more time for projects which are only in the first stages of reaching the community.
- *Repeatedly emphasizing the use of anonymization when working with under-age forced migrants.* In some cases such as the one presented in this article, when the anonymization policy is fully understood, it can increase the feeling of "safe space" where YFMs feel at ease when participating. Visual aids and dramatization (e.g., sketches, short videos) may be useful for conveying anonymization policies more clearly. The use of interpreters could also play a major role here. In addition, building an anonymization and data management framework together with YFMs could help to convey the implications of it (positive and negative). This could also be an element which strengthens trust between the facilitators and the co-researchers. We would like to stress the importance of this particular recommendation as it not only relates to the "safe space" aspect (which mediates the YFMs' participation) but also concerns the ethical procedures of the project.

(2) *Supporting and facilitating intercultural collaboration between young members of the host community and young forced migrants.* This lesson resulted from our efforts to generate new spaces of social interaction and cooperation between both groups. Since one of our primary goals was to understand the challenges and needs of YFMs, we focused more on encouraging higher levels of participation in the YFM group than in the local partners. The decision mentioned above allowed the creation of different strategies per each group (Section 3.3).

Three out of six sessions in total were joint activities between all relevant stakeholders (i.e., brainstorming, presenting, and collecting) (Subsection 3.4.1) that included all stakeholders (i.e., YFM, local students, facilitators). For those joint activities, the degree of participation intended for each of the collaborators (Section 3.2) was based on (M. Wright et al., 2010)'s suggestions. Despite the different levels of participation (Section 3.4), the contributions of the YFMs and the local students were equally valuable. Young forced migrants provided their challenges and needs while familiarizing themselves with the city while the locals provided useful ideas about places of interest in Münster that YFMs should (or might want to) know. Beyond these contributions, bringing the two groups together for this task was in itself a valuable step towards social integration.

As the results of the current study show, one of the significant challenges identified by the local participants were the communication barriers, which were due to the lack of common language that was fluently spoken by all participants. Based on our observations during the activities, these barriers seemed to negatively affect the motivation of some participants from this group and they might have reduced their interest in future participation. Our recommendations for addressing these challenges, without recurring to have multiple amount of interpreters, are the use of visual strategies, short brainstorming sessions, and use 'fast' tasks. This kind of approach also provides local students with a first-hand experience of interacting with people who speak an unfamiliar language, and it promotes a mutual learning process among the participants. Moreover, in line with the "dual objective" of PR, this situation might also help the participants from the host community to understand the YFMs' situation better and thus result in a change of attitude towards them.

(3) *Limited proficiency in a shared language is a major challenge but can be addressed using a combination of several strategies.* One of our study goals was to observe how to conduct exploratory sessions using participatory approaches with YFMs with a basic to intermediate level in a shared language. We had positive results (Section 3.5) regarding the use of exploratory activities for gathering first insights and conceptualizing an initial tool to address them. As stated before, we intentionally discarded the participation of intermediaries (interpreters) to help with this gap due to several reasons as detailed in Section 3.3 since dealing with multiple languages could possibly difficult the implementation of the activities. Our case study showed that collecting challenges and needs of young forced migrants using an appropriate *lingua franca* can yield good results. In our case, English was the *lingua franca* and was chosen based on the background of the participants. One could think about doing the case study using another language depending on the context and the background of the involved YFMs. 68% of our participants had at least an A2 proficiency level, which worked well in our case. We thus recommend to use a *lingua franca* in which at least half of the participants have an A2 proficiency level when

doing research with YFMs (without interpreters). By following this idea, essential communication about real-life experiences can take place and social processes are possible to unfold. This can also contribute towards reducing biases in the data, which could result from the addition of an intermediary. Also, by using English we also helped to level the playing field for participation for local and young forced migrants participants. Each measure taken regarding the use (or not) of interpreters should consider that all individuals from the vulnerable group need to feel included and be reassured to express their opinions. This approach worked well for the initial sessions of the participatory research and participatory design processes.

Resuming the discussion about the methods we used to tackle the challenges of choosing a *lingua franca*, we mainly used visual resources (e.g., drawings, icons), especially sticky notes as well as gestures and mimics to encourage communication despite low proficiency in a shared language. By using these tools, we offered multiple channels of communication, which is especially essential when collaborating in multicultural groups with different languages and when wanting to facilitate communication in the light of cultural differences (Ponzoni, 2015). Similarly, these methods enabled us as facilitators not only to keep a fast rhythm of the workshops but also to motivate the participants and to support them during the brainstorming process. Additionally, working with guiding questions as prompts proved to be a valuable measure to stimulate students to reflect on their behavior (for similar results regarding the learning method of scaffolding see (Davis, 2000)). In summary, these results emphasize the importance of using creative methods which are adapted to the research project to promote a more successful implementation of PR in HCI.

(4) Flexibility in the ethics procedure while emphasizing the need of an adequately informed consent process. During the first session, the participants were informed about the project, the conditions of their participation and their right of declining it. At that session, all participants agreed verbally to be involved in the current case study.

Due to their condition of vulnerability (i.e., being all forced migrants and, in several cases, being underage), written consent forms were necessary. They appeared to be the most suitable way for us as a research team to ensure that YFMs and their legal guardians understand their rights regarding their participation in the project and about the data they were providing to us. Also, this gave them the opportunity to learn about their role in the case study and the project's goals in their own time. However, as mentioned in Subsection 3.5.1 not all the written consent forms were signed by YFMs or their legal tutors by the time when the activities started. This was primarily due to the unique circumstances of the YFMs such as legal guardians being in charge of a large number of YFMs who were unaccompanied minors.

Based on our experience, we recommend researchers who are working with YFMs to plan considerably more time to receive written consent than is usually needed for standard HCI user studies. Alternatively, they should adopt a more flexible approach where informed verbal consent is the minimum prerequisite for conducting a study involving a human subject, while written consent follows immediately afterward. As mentioned in Section 3.5 it took four weeks to get all written consent forms for YFMs signed. As a comparison, only two weeks (i.e., half of the time) were needed to get all consent forms from the local participants. The activities started when 80% of the consent forms from the YFMs were signed. Furthermore, through short information sessions, the facilitators could convey the details of the study to YFMs and their legal guardians (e.g., (Lazar et al., 2010; Nguyen et al., 2013; Mahalingam and Rabelo, 2013; Hernandez et al., 2013)). Nonetheless, whether such an additional in-person meeting would work well in this context (e.g., with very busy legal tutors) remains to be seen. In addition, similar strategies such as the ones previously suggested to convey the anonymization process to YFMs may be used during the information activities. These include the use of (audio)visual resources (e.g., short videos without spoken explanations, short draw stories) to explain each part of the process or the possible involvement of an interpreter for each language present in the (potential) co-researchers group.

Finally, based on our experiences researchers and practitioners would be well advised to consider, right from the beginning, the impact that the formal learning setting can have with respect to unbalancing the roles among researchers and co-researchers in participatory activities. Thus, facilitators should be very clear and insistent when informing the YFMs about this aspect, and they should emphasize that no negative consequences will result from their participation.

3.6.2 Lessons Learned Regarding PD+PR Theory

We also identified four key aspects from the case study that relate to PD+PR's theory. The following paragraphs outline these in more detail:

(1) 'PD for useful systems' may not always achieve the inclusion of all relevant stakeholders. C. Dantec and C. DiSalvo (2013) argued for two complementary perspectives of PD: PD for useful systems (i.e., the idea of bringing together multiple stakeholders to provide a solution to a known issue), and PD as infrastructuring (i.e., enable members of a community to identify and address unknown issues in an ongoing manner). The case study presented in this article has primarily focused on the former perspective. One lesson learned is that there is (and probably will always be) tension between the opinions of the different participants involved in a PD project. This tension has been recognized in the literature. Halskov and Brodersen

(2015) pointed out that the PD axiom that those affected by a system should have a say in decisions related to it, is challenged by the very fact that users sometimes only share partial interests. For example, while most YFMs were willing to provide ideas for the tool, the locals were much less keen. These different levels of participation of the two groups and the diversity of wishes expressed by YFMs illustrate this issue: PD for useful systems may be unable to incorporate everyone's idea and thus lead to the 'marginalisation' or exclusion of some stakeholders. The concept of 'agonistic PD' from Björgvinsson et al. (2012) may be helpful in this context. In short, 'agonistic PD' aims at promoting a polyphony of voices rather than seeking rational conflict-resolution. It has proven useful for PD as infrastructuring (e.g., (Björgvinsson et al., 2010)), but its application to PD for useful systems (where design decisions involve necessary choices and trade-offs) needs further investigations in future work. The question of 'how inclusive is agonistic PD?' also has not been conclusively answered at this time (Björgvinsson et al., 2012).

(2) *More discussion is needed regarding the notion of 'safe space' in PD research.* As discussed in Section 3.2.2, the creation of a 'safe space' (i.e., communication setting in which partners can express their opinions freely without fear of stigmatization) is a core principle in PR research. Creating a 'safe space' seems to be essential in PD endeavors as well, and it has occasionally been mentioned in articles discussing the implementation of PD (e.g., (Bertel et al., 2013; Hourcade, 2017)). However, there is a surprising lack of direct discussions in PD research about the notion of safe space for PD itself and the strategies used to create it effectively. We arrived at a point where most of the YFMs felt highly comfortable sharing their views during the sessions (Section 3.5.2) by applying a series of measures: excluding all regular teachers from sessions; stressing that YFMs's views will not be disclosed to third parties; and dealing with cultural challenges with tact (Section 3.4.3). While this is a start, more work is needed to characterize what constitutes a 'safe space' in other contexts for PD such as developing countries, health care, the workplace and the public.

(3) *Need for 'didactic reduction' in order to communicate research-related issues (PR).* During the brainstorming session, it became apparent to the facilitators that YFMs did not need the mere orientation tool we initially had in mind. They instead required a tool that apart of orientation would also provide aid regarding communication and socializing with locals, as well as regarding educating themselves about local culture. Based on that insight, the researchers abandoned their initial research question and adapted the YFMs goal to initiate the process of co-creation of a tool that would respond to those needs. Consequently, the research approach and design of activities were reshaped in collaboration with the young forced migrants, in line with the fundamental principles of PR. Nevertheless, to enable the YFM to really participate in this stage, we had to apply the concept of 'didactical reduction'

(Basten et al., 2013; Futschek, 2013). This means to simplify the complex aspects and decisions in a research process to a level of abstraction suitable for the YFMs situation. It included adapting the language used by relying on a non-technocentric (Greenbaum, 1991) and non-scientific language. In addition, all involved parties had to jointly find an efficient way to communicate. As a consequence, the co-researchers seemed to have a more extensive comprehension of explanations they were given and were able to propose alterations and adaptations. Based on this observation, the authors argue that appropriate 'didactic reduction' is a crucial factor for successfully implementing PR to PD projects with YFMs.

(4) Combining PR with PD can facilitate critical competencies of sustainable development. In our work, we aimed to foster competencies which were core components of sustainable development. In those terms, first, in the process of co-constructing the research question and research design, the co-researchers gained a better comprehension of the complexity of the situation as a system ("holistic approach" (UNECE, 2012)). Second, based on the young forced migrants' experiences and insights from data collection and evaluation, they were able to develop plans and proposed further steps to take in the project. They could also explore alternate ways to act in the future and were inspired to engage with the topic and to "envision change" (UNECE, 2012). Third, by leaving important research decisions to the YFMs co-researchers, we aimed to "achieve transformation" (UNECE, 2012) in the way they perceived their situation and, more importantly, their options for action and engagement. Since YFMs are not only collaborators on the product development, but also in conducting the research, they gained valuable competencies that facilitated not only short-time change but also a sustainable development for some aspects of their (re)settlement process.

3.7 Conclusions and Future Work

In this article, we reported on the participatory methods we used in a case study with young forced migrants (YFMs) to gain a deeper understanding of advantages and disadvantages of using participatory design (PD) and participatory research (PR) with this group. We also gathered initial insights regarding their needs and the requirements for a technology-based tool which aims to support them upon arrival and their (re)settlement process in an unfamiliar urban environment. To engage and build trust with YFMs, we combined methods from PD and PR. Our findings and experiences from this study indicate that this combination of PD and PR strategies can be applied successfully to YFMs with a number of adaptations. These adaptations relate to creating an informal environment, to using a facilitator who shares experiences of and with the target group, and to explicitly promoting interactions between different groups of stakeholders (facilitators, host community

members, and young forced migrants). We observed some benefits for practices arising from the combination of PD and PR in the particular case study here presented. These benefits include the creation of a ‘safe space’ as an opportunity for YFMs to participate; the possibility of empowerment and engagement because of the activities; and YFMs driving adaptations of the research framework and the potential artifact to increase its potential impact. At the same time, we identified several challenges with respect to our method. These are mainly related to engaging young members of the host community in a formal education setting in the participatory activities; to creating more effective means to overcome the limited common language proficiency for the research; and to the compelling communication of the collected data management procedures to YFMs. Limitations for our specific case study include its relatively short duration and the variation of the number of participants during the activities. Obtaining written consent before the start of the study also proved to be a challenge.

From the experiences we gained, we derived a series of lessons learned regarding the impact of our results in PD+PR theory. We found that the premise of PD to create useful systems might not always allow researchers and practitioners to achieve inclusion of *all* relevant stakeholders successfully. As a result, tension among the diverse actors who are part of the activities can be also present, which can become challenging to manage. Further explorations in the field of ‘agonistic PD’ (Björgvinsson et al., 2012) might help to address such situations. We also recognized the need for a more direct and in-depth discussion in PD concerning the possible role and characteristics of ‘safe spaces’ guided by the PR reflections. In addition, we argued that ‘didactic reduction’ can play an essential role when communicating aspects related to PR strategies to groups of young forced migrants. Finally, we concluded that PD+PR can promote competencies in YFMs related to the sustainable development framework.

In terms of future work, we are currently planning a series of follow-up workshops with groups of YFMs collaborators, who are interested in continuing the work. As part of these workshops, we intend to provide participants with fundamental knowledge and skills in user experience and UI design. Our goal here is to empower them to operate and modify "dynamic, complete, editable, and easy-to-use" digital mock-ups that we will create based on the results of the initial case study presented in this article. We plan to use these mock-ups to drive the subsequent development of a high-fidelity prototype to support young forced migrants upon arrival and during their first stages of resettlement in Münster. The development process (as well as subsequent deployment) will continue to follow a PD+PR approach as outlined in this article. We expect that by doing so, we can deepen our methodological understanding of PD+PR approaches to conduct research and design projects with (and not just for) YFMs to support them in their (re)settlement process. In the more

distant future, additional studies with further groups of YFMs that replicate (and extend) our work would be desirable. It would enable us to validate our findings with other participants and would also broaden our understanding of how to best involve young forced migrants in PR and PD processes in HCI projects.

“Safe spaces” in Participatory Design with Young Forced Migrants

This chapter was submitted in preparation for the International Journal of CoCreation in Design and Arts as Ana Maria Bustamante Duarte, Mehrnaz Ataei, Nina Brendel, Auriol Degbelo, and Christian Kray. “‘Safe Spaces’ in Participatory Design with Young Forced Migrants.” It corresponds to the P3 in the List of Publications.

Abstract. *Previous participatory design (PD) research has referred to ‘safe spaces’ or ‘safe environments’, particularly when working with vulnerable or marginalised communities. Despite this, the role of these space, their characteristics, their potential impact and what enables them are still not yet fully understood. In this article, we thus report on a six-week co-design study with 19 young forced migrants, where we investigated factors that enable ‘safe spaces’ while developing digital tools for their use. We based our approach on four main components: ethics, content, a set-up for promoting participation, and reflective processes. Our findings indicate that ‘safe spaces’ can be promoted through the combination of these four components. Participants exhibited a high degree of engagement, seemed to be comfortable while interacting socially, and showed signs of developing a trust relationship with the facilitators. Based on our results, ‘safe spaces’ can thus be enabled by the four proposed components and can provide a theoretical basis for inclusive, participatory projects in Human-Computer Interaction. The work presented in this article can benefit designers engaging vulnerable communities in participatory activities.*

4.1 Introduction

‘Safe spaces’ have been discussed in several disciplines, particularly in education and participatory research (PR) (Bergold and Thomas, 2012). In Human-Computer Interaction (HCI), previous work has discussed the importance of ‘safe spaces/environments’ when working in participatory processes with diverse communities (Bustamante Duarte et al., 2018; McNally, Mauriello, et al., 2017; Hardy et al., 2016; Gram-Hansen and Ryberg, 2016; Jorge, 2001). However, limited

reflections are available on the role, characteristics, and the potential impact of these spaces when working with young forced migrants. Insights into this can provide the research community with an increased understanding of theoretical components for inclusive participatory projects in HCI. With growing numbers of refugees and more than half of them being under-aged UNHCR (2017c), this is a very urgent and timely matter (Marlowe, 2010).

The research projects mentioned above, as well as others, have highlighted the potential of participatory HCI and digital technologies in the context of forced migration, in particular with young people. Nonetheless, the literature offers little documentation on the planning and implementing phases of such participatory projects. There are also few if any projects reporting in detail on the strategies used to promote participation. In particular, there is little information that details how participatory strategies ensure dynamics where participants feel motivated to speak and not judged and are encouraged to truly engage in co-design. ‘Safe spaces’ are particularly promising with respect to facilitating these aspects.

In this article, we present an approach to enable ‘safe spaces’ for and with YFM through four components: 1) ethics, 2) content, 3) set-up for promoting participation, and 4) reflective processes. We report on a case study, where we evaluate the presence/absence of a ‘safe space’ through three criteria (playing the role of proxy measures): the engagement of YFMs, their trust building with the facilitators, and their comfort level during the participatory activities. Also, we provide a set of lessons learnt from the case study. The remainder of this article first briefly discusses relevant related work and then reports on the case study as well as its key findings. The final two sections highlight lessons learnt and summarise our main contributions.

4.2 Related Work

In this section, we briefly review how the concept of ‘safe spaces’ has been considered in the fields of HCI and education. The latter is of particular relevance when engaging YFMs. Since our case study with YFMs focused on co-designing digital tools for their use, we also briefly discuss previous work related to YFMs and digital technologies.

4.2.1 ‘Safe spaces’ in Participatory HCI

‘Safe spaces/environments’ in participatory HCI projects have been mainly addressed in research with vulnerable communities such as children (S. A. Brown and Gemeinboeck, 2017; McNally, Mauriello, et al., 2017; Guldborg et al., 2010), homeless

(Hardy et al., 2016), and elderly population groups (Jorge, 2001). Also, it is relevant in HCI research in intersectional HCI (Schlesinger et al., 2017), healthcare (Peters et al., 2018; Wolters et al., 2017; French et al., 2016), ethical reflections (Gram-Hansen and Ryberg, 2016; Durrant and Kirk, 2018), and creation of learning spaces (Halbert and Nathan, 2015), among others.

Some researchers have discussed the potential characteristics of ‘safe spaces.’ For example, McNally, Mauriello, et al., 2017 identified group work and reliability on teammates as core aspects for ‘safe spaces’ creation with children. In these spaces, they produced and combined ideas along with learning how to communicate them to others effectively. McNally, Mauriello, et al., 2017 also highlighted that ‘safe design environments’ should be a goal of PD because they promote participants’ gains (e.g. confidence) from PD activities. Gram-Hansen and Ryberg, 2016 emphasised the importance of ‘safe contexts’ to empower and support participants’ sharing of ideas and reflections during/after the activities. Halbert and Nathan, 2015 in their study of technological practices supporting engagement in distressing situations highlighted that the notion of ‘safe space’ differs from person to person. The authors defined ‘safe spaces’ as learning environments where trust and support are fostered without silencing feelings of discomfort and voices of dissent ‘towards more palatable forms of discourse.’ Lastly, Bustamante Duarte et al. (2018) introduced the concept of ‘safe spaces’ in an HCI project carried out with young forced migrants in a formal education set-up as a result of combining principles from participatory research and PD. The authors highlighted five aspects to enable ‘safe spaces’ with YFMs. All of the previous authors’ characteristics of ‘safe spaces’ are summarised in Figure 4.1 (right).

4.2.2 ‘Safe spaces’ in Educational Set-ups

Since the late 90s, the term ‘safe space’ has been used as a popular metaphor with diverse and different definitions (Boost Rom, 1998). Boost Rom (1998, p. 407) defines it as a space in which ‘individuals and groups know that they will not face criticisms that would challenge their expressions of identity.’ Holley and Steiner (2005, p. 49) states a ‘safe space’ stands for ‘a desired classroom atmosphere.’ There, ‘students can freely express their ideas and feelings’ and are ‘willing and able to participate and honestly struggle with challenging issues’ (Holley and Steiner, 2005, p. 49). They ‘feel secure enough to take risks, honestly express their views, and share and explore their knowledge, attitudes and behaviours. [...] classroom safe space refers to protection from psychological or emotional harm’ (Holley and Steiner, 2005, p. 50).

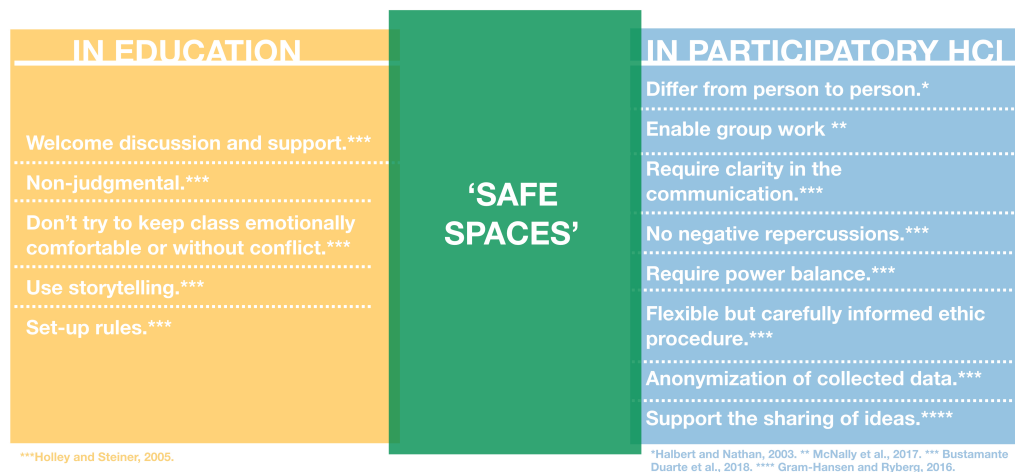


Fig. 4.1: Overview of ‘safe spaces’ characteristics in education and participatory HCI

However, in education, a ‘safe space’ should not be misunderstood as a space of comfort without conflict or dissent. Boost Rom (1998, p. 407) states, ‘when everyone’s voice is accepted, and no one’s voice can be criticised, then no one can grow.’ According to the author, being comfortable censors critical thinking. It is rather the ‘friction of dialogue’ (ibid) that sparks critical thinking and reflection on one’s perspective. Consequently, the author argues that teachers have to ‘manage conflict’ (ibid) rather than prohibit it. More detailed characteristics of ‘safe spaces’ in education provided by Holley and Steiner (2005) can be seen in Figure 4.1(left).

Holley and Steiner (2005, p. 52) further indicate that ‘attempts to create a space where all students will feel safe can be particularly difficult in a multicultural classroom. There are cultural (e.g. ethnic, gender, regional, age) differences in the appropriateness of speaking up in a group, sharing personal information, challenging others, public versus private demonstration of learning, and the appropriateness of disrupting the harmony of a group.’ Feeling comfortable in classrooms does play an important role for underrepresented groups to experience a classroom as a ‘safe space’. This is even more important in the context of vulnerable groups that are underage.

All the studies mentioned above were conducted with adults in a higher education context. A focus group study by Gayle et al. (2013) found that (adult) students expressed that discomfort and conflict in a ‘safe’ classroom are necessary and productive for their learning. It can be doubted that this high level of reflexivity and acceptance of discomfort/conflict can be expected of high school students, even less so if they belong to vulnerable communities. This leads to the conclusion that (a) the level of vulnerability and (b) the level of reflexivity due to age are crucial factors determining the level of comfort that a person needs to experience a classroom as a safe space.

4.2.3 Digital Technologies and Forced Migration

The use of digital technology has profoundly changed the dynamics of most recent forced migration movements (Gillespie, Osseiran, et al., 2018), particularly during (re)settlement (Kaufmann, 2018). There have been various projects in HCI to explore the use of digital technologies to support forced migrants. For example, D. Brown and Grinter (2016) developed and evaluated a human-in-the-loop translation tool for forced migrants. Baranoff et al. (2015) explored a community-generated guidance platform using near-field communication to support forced migrants' arrival in host cities. Weibert and Wulf (2010) evaluated how computer clubs help with promoting sustainable and cultural integration in Germany.

Similarly, Yerosis et al. (2015) and Aal et al. (2014) highlighted computer clubs as open spaces which enable mutual learning between YFMs and (local) student volunteers. Bustamante Duarte et al. (2018) looked into the role of participatory design (PD) and participatory research (PR) to co-design a mobile geospatial service to support YFMs' arrival and first stages of (re)settlement in Germany. Fisher and Yefimova (2016) reported on the challenges faced by young Syrian refugees at the Za'atari refugee camp where participatory activities to co-design ICT wayfaring technology with them were held. Lastly, Talhouk, Montague, et al. (2017) and Talhouk, Mesmar, et al. (2016) through a combination of strategies (e.g. focus groups, interviews and participatory activities) explored the role of digital technologies for healthcare provision in Syrian refugee communities in Lebanon.

4.3 'Safe spaces': A Case Study

4.3.1 Context

We held participatory workshops with 19 YFMs enrolled at a vocational high school in Münster, Germany to explore the components enabling a 'safe space' during a participatory design project with YFMs. The workshops revolved around the co-ideation and co-design of a smartphone app to support YFMs upon their arrival in a new city. The full study lasted about a month and a half. It had four project information sessions (spread over a month in October 2017), and four participatory workshops sessions (spread over two weeks in November 2017). The definition of the structure, activities, and content for the workshops required a multi-actor participatory strategy (young forced migrants, staff of the vocational school they were enrolled at, and facilitators). Participants of the study were from various countries (Afghanistan (N=7), Eritrea (N=4), Syria (N=4), Guinea (N=1), Iran (N=1), Nepal (N=1), and Nigeria (N=1)). They were between 15 and 18 years old.

Participants were reported, by the school where they were enrolled, to have been taking classes for German language learning for at least eight to 12 months.

4.3.2 Components to Enable 'Safe Spaces'

For the remainder of this work, 'safe spaces' are defined as environments for promoting open communication, engagement and knowledge exchange among participants. This definition is in line with Holley and Steiner (2005)'s idea of an atmosphere where people can freely express their ideas and feelings and are willing and able to participate. It is also compatible with Halbert and Nathan (2015)'s view of 'safe spaces' differing from person to person (what makes a person communicate/participate more, might not necessarily entice others to do the same). The work explored the effect of the combined use of four components in the process of enabling safe spaces: 1) ethics, 2) content, 3) set-up, and 4) reflective processes (Figure 4.5). These components were selected based on our personal experience working with YFMs, and ideas from the existing literature on 'safe spaces' in education and didactics. The characteristics of each of the components will be introduced in the following paragraphs.

Ethics

This component had two main aspects: first, a decision on the appropriate compensation strategy for the YFMs participating in the research; and second, the implementation of an informed consent process that takes into account the peculiarities of conducting participatory HCI research with these communities.

The work was conducted bearing in mind Mackenzie et al., 2007's insistence on the necessity to ensure *reciprocal benefits* while doing research with and for refugees. In this respect, the researchers did an initial assessment of *compensation mechanisms* which were not only adequate, but that could also help to motivate participation of YFMs in the activities. The assessment was based on 1) observations from the actors involved (YFMs and staff members at their school), and 2) feedback from our prior research (Bustamante Duarte et al., 2018). The school's staff members suggested a tech-related academic content as a possible compensation (and motivator) since several of the YFMs enrolled at their school were searching for internships at tech companies. Thus, classes on these themes along with certificates of attendance could be used by YFMs to support their internship applications. After discussion with the YFMs (during which they were encouraged to voice any expectations), the idea of a workshop on 'design thinking for mobile applications' was selected as a topic for our collaboration.

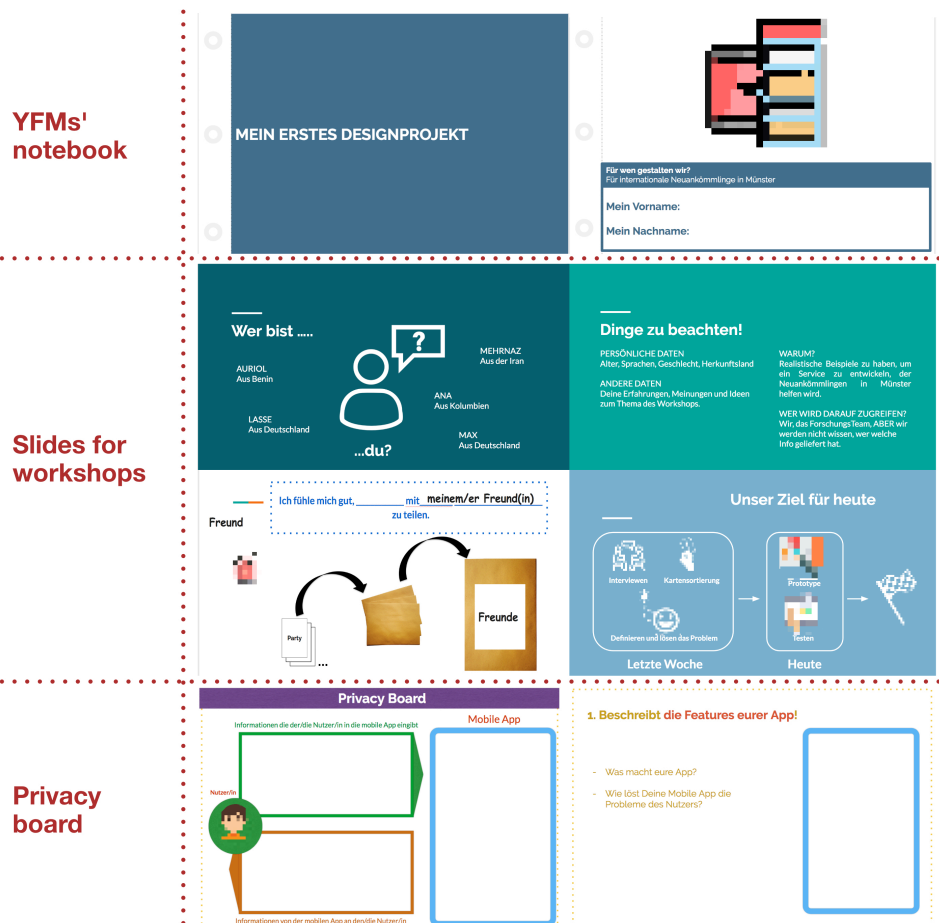


Fig. 4.2: Examples of material used in the workshops

Regarding the informed consent process, an approach was developed based on some of Mackenzie et al. (2007)'s beyond 'do not harm' reflections. It had three central concepts underlying its design and implementation. These aspects were 1) an iterative character, and 2) the addition of layered-out consent options inspired on the 'dynamic consent' (DC) concept.

The *iterative consent model* was proposed in Mackenzie et al., 2007 as a more culturally appropriate approach. It requires a constant re-conceptualisation of the research process and the relationships created within it. In the frame of our project, four iterative informative sessions were done in the first month of the study. Four additional sessions were held during the workshops. Each of the iterative information sessions (before the workshops) had a duration of 30-40 minutes and served to provide more details on the research project progressively. They also provided information on the purpose of the data to be collected later during the workshops, and YFM's rights in the research project.

Layered-out consent. During the informed consent process, we used the concept of ‘dynamic consent’ (DC) Kaye et al., 2015. ‘Dynamic consent’ allows specificity on what is being consented to and to change it at any point in time. It opposes to the widely spread idea of ‘static’ (i.e. one-time) consent for all data collected. DC was introduced to biomedical research. It puts participants at the centre of the decision-making regarding the project’s collected data management. Participants can choose and alter at any moment their consent choices during the research project (and when still practicable, after the research project was finished). DC was used during the work to get two types of consent: consent for their participation in the workshop(s), and authorization to take their pictures during the activities.

Content

As said above, ‘design thinking for mobile applications’ was selected in agreement with the YFMs as the theme of the four participatory workshops. Each workshop corresponded to one of the design thinking stages (empathise, definite, ideate, prototyping, and testing).

All activities and their material were planned to promote the sharing of knowledge among all actors. The facilitators brought their content knowledge (McNally and Guha, 2017) on design thinking and mobile applications. And, YFMs brought their content knowledge on their life experiences (in general and during their (re)settlement), their information sharing strategies, and their use and perception of digital mobile applications. We made use of various resources in these sessions such as card sorting, personas, sticky notes for brainstorming, prototyping, privacy boards, mini-scripts for brief interviews exercises, and group discussions (Figure 4.2). All material was built using two central concepts from education, namely ‘didactic reduction’ and reflective processes. In education, ‘didactic reduction’ is seen as a strategy to simplify complex concepts while providing progressively more details on these for students (Shmatkov, 2016). ‘*Didactic reduction*’ was used to generate more comprehensive material which eases the introduction, communication, and possible, the comprehension of the concepts dealt with to YFMs. For example, we did material that had simple sentences in the German language, which conveyed information progressively in and through the sessions on complex information. Combining this with iterative hands-on activities presented with a step-by-step guide was another tool used based on this concept. As for the use of reflective processes in our case study, this will be explained in detail in Section 4.3.2.

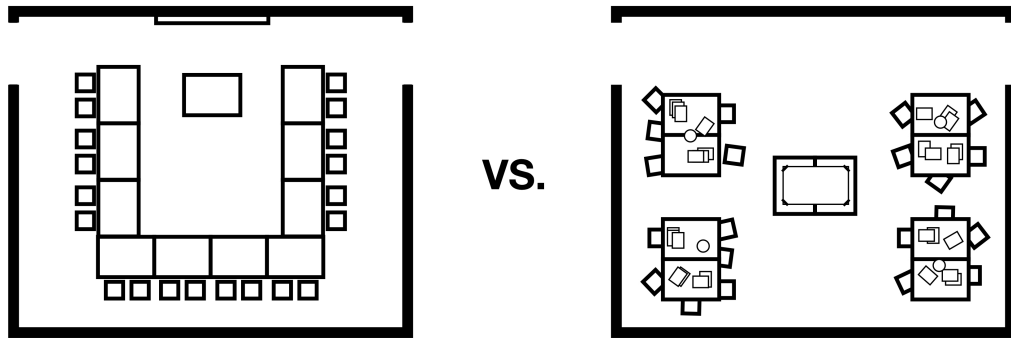


Fig. 4.3: Spatial Layout: Before (left) and Modified (right)

Set-up

The set-up of the participatory workshops considered several factors such as location, language used for the activities, spatial layout, facilitators' agreements, and cultural identification strategy.

Related to the *location*, the participatory workshops were offered as extracurricular activities to be held at the university to which researchers were affiliated. This was a decision taken based on results from a previous study (Bustamante Duarte et al., 2018).

As for the *language* to conduct the activities, German was selected by the participants as the primary language (further detail on the decision process can be found in Section 4.4.4). Its selection used a 'lingua-franca' approach as done by (Bustamante Duarte et al., 2018) to ease group communication and activities. In general, four facilitators on average were present in each session, two with high proficiency in the German language, two with high proficiency in English. Also, facilitators' native languages along with knowledge of Farsi and French were used to support the communication with the YFMs participating.

Furthermore, the *spatial layout* was informed by McNally, Mauriello, et al., 2017's insights into 'safe design environments' and was changed from the 'classical' classroom spatial arrangement (Figure 4.3, left) to a room with spaces for small/large group discussions (Figure 4.3, right). Brainstorming activities using sticky notes (Peterson and Barron, 2006) were done to boost participation and cooperation among a multi-cultural group and to keep up with the group's communication pace (Bustamante Duarte et al., 2018).

Agreements on the facilitators' behaviour were implemented as well as a constant search for strategies which ease communication and enable trust building among

and between the actors involved. Examples of agreements reached by facilitators, some before the activities and others added during there, were:

- to use an informal and non-technocentric language based on Greenbaum (1991)'s recommendations.
- to wear informal clothing to bolster power balance as advised by Druin (2002).
- facilitators gave and encouraged participants to use their first names as suggested by Druin (2002).
- not stand up when sharing educational content to try to keep the power balance between the groups. The same suggestion applies for one-on-one communication.
- to rotate through all groups to facilitate casually to avoid generating extra pressure on participants or feelings of being evaluated.
- to avoid sensitive personal questions, for example about their family, and living situation.

Additionally, an exploration was done for a *cultural or background identification* strategy where facilitators purposely stated their first names, and countries of origins (Benin, Iran, Colombia, and Germany) directly, and mentioned when asked the languages they were fluent. Thus, the activities started by laying out the basis for a cultural identification between young forced migrants and facilitators.

Overall, the set-up proposed aimed to create a physical space which encourages individual and group work, communication, and discussion in more organic ways for the diverse YFMs participating.

Reflective Processes

Reflective processes have been the subject of extensive discourse in education and didactics. There are two major concepts of reflective processes 1) reflective thinking, and 2) reflexivity. In this case study, we focused on reflexivity which refers to an active, constant, and careful consideration of one's own or other people's actions. Schön (1983)'s discussion on reflective practices distinguishes reflection *in* action (while doing something) and reflection *on* action (after something has been done). Various models have been proposed to diagnose and foster reflective processes (Kolb, 1975; Korthagen and Vasalos, 2005; Boud and Walker, 1985; Henderson et al., 2004;

Brendel, 2017). We created spaces and material to promote, mainly, reflection *on* action in all actors involved (YFMs and facilitators).

For the *reflective processes* of YFMs, the following actions were considered:

1. *Brief reflective questions* at the beginning and end of each session. Participants were encouraged to share their opinion, feeling, and feedback about the activities held, as well as on aspects to improve for the upcoming sessions. The ones held at the beginning of the sessions intended to ‘reactivate knowledge’ (McNally and Guha, 2017) from previous workshops in YFMs.
2. *Iterative hands-on sessions* during the co-design process where they were encouraged to assess and discuss their past, current and potential use of mobile applications. The insights on this were expected to inform, together with the experiences from the participatory activities, their designs for the mobile apps.
3. *Discussions in small and large groups*, as well as peer assessment activities based on reflective strategies where reflective prompts (in the form of guiding questions) were combined with the other resources (e.g. personas, privacy board, brainstorming).
4. *The use of an advanced organiser* which allowed us to state clearly and shortly the general objective of the session, at the beginning of each workshop.
5. *The use of written reflective diaries* (with reflective prompts) were provided. Diaries allow freely recording of feelings and experiences that participants would not share face-to-face interviews. (Barker and Weeler, 2003).
6. *Small group interviews* in the last session as a mean to encourage YMFs to identify, assess, and deliberate on what was done, and suggest improvements for future participatory workshops related to digital technology with them (or other young forced migrants).

An important aspect to keep in mind regarding reflective processes with YFMs is that they are introduced in this case study looking for two main effects. One, as a way to promote more agency of YFMs on the shaping of the workshops’ activities. And the other, as a mean to foster YFMs learning of, and from, tech and design-related concepts and actions.

The *reflective processes on action* of facilitators were encouraged through the use of written diaries and short post-session discussions. The written reflective diaries were meant to document their perspectives (experiences, feelings, and emotions)

on the activities (Kunz and Pfadenhauer, 2014, p. 21). The unique perspective of facilitators helps not only to assess their roles but to redefine them (Segbers, 2015, p. 295). Short discussion meetings were held after each session finished. These were done to discuss, assess, and take measures on changes needed for the next activities based on YFMs' feedback and the facilitators' observations of each particular workshop.

4.4 Findings

Qualitative data was collected on this case study in the form of facilitators' and YFMs' diaries, semi-structured group interviews done in the last workshop session with YFMs, and the annotations from the reflective questions done at the beginning and end of each session. The data was transcribed by three research team members and was analysed using MAXQDA in two iterative cycles. Three criteria were used as proxy measures of 'safe spaces' being enabled: *'comfort level' of participants, engagement, and trust*. The quotes from diverse participants in each of the groups are presented using the Group#_P# acronym.

4.4.1 Engagement

All facilitators highlighted in their diaries (filled independently after the workshops) that the level of engagements of the participants was particularly high (mainly during the second and third sessions)¹. Four features of the study could have contributed to this: content knowledge exchanges for fostering reciprocal benefits, the location of the activities, the spatial layout and the use of paper-based prototypes.

Content knowledge exchanges as means to foster reciprocal benefits. The decision of conducting activities on 'design thinking to design mobile applications' was observed to have attracted several young forced migrants to participate in the workshops. For instance, participants stated during the group interviews done in the last workshop, that they *have learnt a lot*. Also, one participant (Group2_P2) expressed that the activities helped him to approach and advance towards the achievement of skills in problem-solving. Additionally, familiarisation with mobile applications development, and in some cases also use, was highlighted as a positive factor by participants. Group 1_P2 mentioned, for example, *'I have a mobile phone, but I don't know how one can use the mobile phone, and that was interesting.'* One more aspect to mention is that participating in these activities seemed to have benefited some YFMs to the extent that they felt confident in helping others. Related to this, Group3_P2 said *'I find this program very good because I can help other people who have come [newly in*

¹The data collected during the study is available upon request to the authors.

Münster].’ Overall, the activities seemed not only to be of interest for YFMs but also of value to them.

Based on the above, it can be said that these strategies selected for this case study from the *ethics* and *set-up* components show initial promising results. The idea of not using a monetary compensation, and instead create a space for knowledge exchange and mutual learning on tech-related topics, has the potential for future participatory HCI research projects with YFMs. Some participants stated that they would like to continue participating in future activities, highlighting topics like ‘*get to better [know] German people, and what is good here in Germany and what it is not good?*’, or ‘*no matter the topic, it should be around computers/programming.*’ as potentially interesting to them for follow-up workshops.

Location of the activities. This too seemed to have positively impacted the participation of YFMs in the activities. The decision of holding the workshops outside the school environment, particularly when carrying out the activities in a university setting, received positive feedback from the participants. For example, participants stated that having the activities at the university instead of the school was ‘*better*’ (Group1_P2) or ‘*very good*’ (Group2_P1), and ‘*that maybe in the future I would like to be here*’ (ibid).

Based on these preliminary insights, the change of location from school to the university, not only benefited the participants’ engagement level with the activities, but it also presented new scenarios for YFMs to consider to be part of in the future.

The spatial layout for the activities promoted YFMs’ engagement. On this matter, three facilitators highlighted how conducting the ideation activities (whole-group brainstorming and discussion) in the centre of the physical space contributed to YFMs engagement. Furthermore, several YFMs emphasised working in groups as a core aspect for them. In this respect, Group2_P2 remarked that when working in groups *one can talk with others and find a lot of information*’. Also, these group dynamics were highlighted as ‘*very enjoyable and different from the school setting*’.

The use of paper-based prototypes throughout all workshops encouraged YFMs’ engagement. For example, all facilitators pointed out high levels of participants’ engagement on the workshop where the prototyping activity was conducted. On this session, around half of the participants, despite being encouraged by facilitators to go out of the activity’s space during the snacks break, continued elaborating their prototypes (Figure 4.4). They served as a tool to engage participants who were at the beginning asking on the ‘*use computers*’ at any point for designing the mobile applications.



Fig. 4.4: Participatory workshops (including group discussions, hands-on activities, privacy board, and paper prototypes)

4.4.2 ‘Comfortable’ Spaces and Trust Building

Overall, it is difficult to discuss separately the strategies that enable ‘safe spaces’ which impacted one or another of the proxy measures. The complexity is based on how intrinsically related are all of the concepts, actions, and variables which enable these spaces in PD. However, the reflections here presented are provided on the strategies that generated a more ‘identifiable’ impact. For the case of ‘comfortable’ spaces and trust building the separation was not possible as it was with the engagement variable. For these two, several strategies from the components are related, as presented below.

Layered-out and iterative consent process. Insights on it showed that this type of consents was at first difficult to explain to young forced migrants. However, showing example images which explained the future use (e.g. publications) and treatment of the pictures collected (before and after ‘blurring’ them) helped to transmit the message better. Based on the researchers’ observations, participants were more comfortable having the option of a separate form between granting consent for participation in the activities and consent for pictures collection.

YFMs-Facilitators’ communication. During the workshops a constant and informal communication between both groups was present. An open and informal environment was created where open discussions, talks, and questions were encouraged within the PD dynamics. Several participants were openly sharing with the facilitators their experiences and views about their lives and situations faced before and after their forced displacement. Many were sharing without inhibition their opinions on matters which could be considered sensitive if told to other actors. These indicated that participants were feeling comfortable in the activities. In addition,

there was an interesting anecdote is that two participants asked (in Farsi, their native language) to the Farsi speaking researcher, with whom they have been close through all the sessions, if she was a certified psychologist (so that they could talk to her, and get some advice on very sensitive and personal situations). This illustrates to building trust among researcher and YFMs (at least some) has happened during the activities.

The space's layout might have facilitated communication and discussion among YFMs. At least two facilitators observed that space's layout to encourage YFMs to seat in groups of four to five people fostered cooperative and supported dynamics among them. Such a strategy combined with the direct promotion of informal communication dynamics among all actors nurtured open, comfortable, and flexible spaces for discussion and mutual learning. This point also derives from the insights in the previous Section 4.4.1 regarding YFMs feedback on the group collaborations.

4.4.3 Constant Reflections of Facilitators

The reflective processes on action for facilitators were of great value for the continual adaptation and update of the activities. The results of the facilitators' diaries and their group discussions, which also reflected on the feedback provided by YFMs during the sessions, was the material which informed such processes. The insights gained through these processes served to identify major aspects and to more effectively incorporate the feedback received from YFMs based on each day's observations. All observations supported the adaptation of the next activities to address in a more adequate way the conditions and requests of YFMs to continue enabling 'safe spaces' to support their participation engagement. Diaries recordings of the first session were done after the group discussion which might have influenced some of the researchers' entries, but overall, continuous reflective actions on the side of facilitators have proved promising to recalibrate the PD, and research processes as 'safe spaces' are enabled with and for YFMs participating.

4.4.4 Aspects for Recalibration

Based on the insights from this case study, several aspects and strategies from the proposed components to enable 'safe spaces' in PD projects in HCI with young forced migrants need to be entirely changed or recalibrated. These are as follows:

The use of German language as the common language for the activities received diverse and conflicting feedback. As stated in the Section 4.3.2, the German language was voted by the participants in the meetings before the participatory workshops

as the common language to use during the sessions. However, when the activities began, after mentioning the languages facilitators were native on, two participants proposed to have small independent groups, each guided by a facilitator who could know their native languages. This would not have been practical, but nevertheless, the facilitators asked the group about their opinion. The majority of the group, arguing about their diversity of languages, voted to keep German as the common language of the workshops.

To some, following all activities in German was challenging but still pleasing. Group1_P1 commented *‘it was good, but also difficult [because of the] new information.* Others, however, did emphasise the importance of translation to the native language. Group1_P2) stated for instance: *‘There were some words that I did not understand. . . . We had to translate.’* In a similar aspect, Group3_P2 highlighted *‘I found the workshop good because there was the lady who speaks Farsi who helped me a lot because I do not understand much German, and I have learned a lot’*. As a suggestion for future activities, some participants proposed to have the activities material in *‘their own languages’*, even if the joint discussions are carried out in German. This would help them to *‘quickly understand what to do.’*

Reflective Processes on Action on the Side of the YFMs. There were some mixed results regarding this: The short reflective questions at the beginning briefly reminded the group of the key ideas of previous activities and served as a bridge to newer ones. However, the questions at the end of the session did not run as expected for two reasons: hands-on activities taking longer than planned, and participants being somewhat less focused on the activities by then.

The written diaries for young forced migrants did not work as expected. Around half of the participants did not write a single into the diaries. The other half some registered entries only for the first day, where at least three diaries had similar texts. Solely two diaries had observations by young forced migrants for at least two sessions. The questions aiming to promote reflection on young forced migrants did not work. One factor which could have influenced this was the use of German language for formulating and answering the questions. The other factor could be that diaries were suggested to be written after the activities were done in their spare time. Further iterations on our work should consider other forms of diaries such as audio, video or photographic diaries, as well as explicitly promote the option for them to record in their native languages and highlight the value of them doing so.

The remaining three strategies (iterative hands-on activities, discussions in small and large groups, and the group semi-structured interviews) were positively reviewed either by YFMs or by the facilitators as shown in previous sections. Mostly, it can be expressed that these tools and strategies partially obtained one of the two effects

expected (stated in Section 4.3.2). They promoted YFMs' agency on shaping the workshops' activities since the data used through the combination of all strategies supported the reflective practices *on action* of the facilitators to adapt the PD project and its follow-up activities. The second effect, on fostering YFMs' tech and design-related learning, could not be assessed in this case study. Thus, no further insights can be drawn in this regard.

Iterative activities were appreciated by YFMs. For example, Group2_P1 stated 'The first time it is a bit difficult [...] but the following times, it was easy.' However, YFMs were emphatic on the topic that the workshops needed to be more, and they suggested this to be improved in future activities. Overall, they manifested the time 'was a bit short, and it would be more beneficial for them to 'come twice, three times, and learn more.' Lastly, as a more general comment various participants highlighted '[to] learn new information', '[coming up with] ideas' and 'speaking', as the most challenging aspects during the activities (and this could have been partly influenced by their limited proficiency in the German language used during the activities).

4.5 Lessons Learnt

The present project intends to ignite further discussions on 'safe spaces' when conducting participatory HCI research with young forced migrants. As said previously, 'safe spaces' have often been mentioned in the documentation of research projects, particularly in projects with marginalised or vulnerable communities. However, detailed reflections upon them have been scarce despite their potential in PD, e.g. for intergenerational PD (see McNally, Mauriello, et al., 2017), with children by promoting teamwork and communication dynamics among them (ibid), with young forced migrants (Bustamante Duarte et al., 2018), and, in general, easing empowerment of participants to share ideas (Gram-Hansen and Ryberg, 2016). Our approach to enable 'safe spaces' in this specific context consists of four main components: 1) ethics, 2) content, 3) set-up, and 4) reflective processes (see Figure 4.5).

Regarding *ethics* we learned several aspects. First, the introduction of *extra-curricular* participatory activities which promote content knowledge exchanges between all actors revolving the topic of digital technology and its design has the potential for participatory HCI with young forced migrants. Specifically, YFMs recognized its usefulness in their context, and this shows possibilities for constituting value-driven activities for them. Hence, reciprocal benefits for YFMs on the project were, somehow, promoted by the activities done, and the initial conceptualization of a mobile digital service. Future work on this matter could also include insights from the *content* component and to develop workshops which are in line with B. DiSalvo

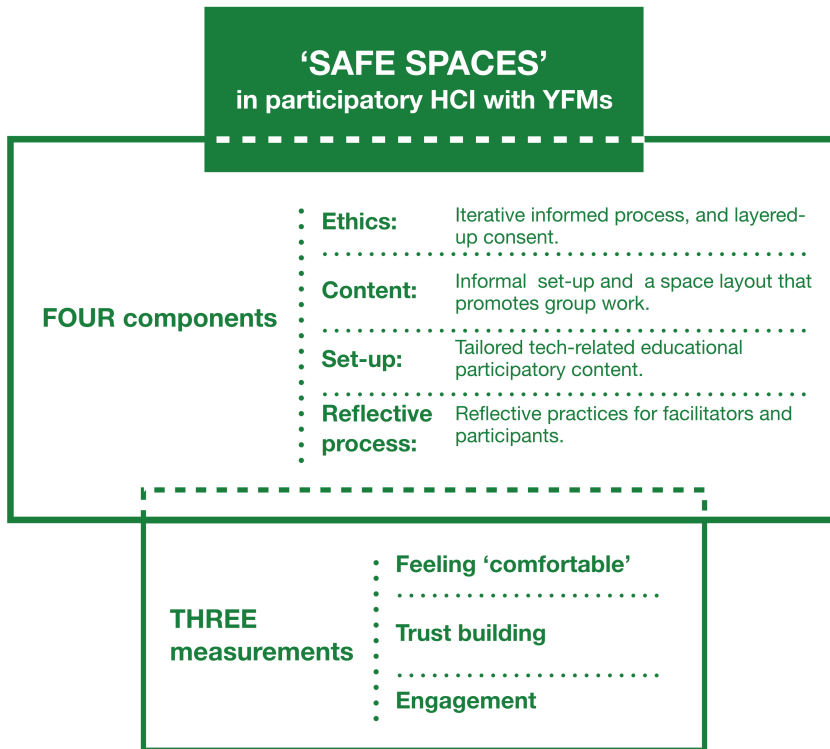


Fig. 4.5: Overview of ‘safe spaces’ concept: four enablers and three factors for measuring success.

and DesPortes (2017) findings on value-driven learning on PD projects for learning with culturally diverse communities.

Second, the iterative informed consent process and the layered-up consents seemed to have worked well, given that participants felt comfortable during the activities. However, there is a need for further explorations to determine their advantages and drawbacks (e.g. in comparison with one-time consent) in this type of research context. An aspect that is certain from our experience is that the iterative consent draw researchers involved in the project to re-conceptualised and recalibrate the research itself, as suggested by Mackenzie et al. (2007). Implementing an iterative consent process helps researchers to assess in-depth and take more careful measures on the type of research conducted as well as their possible negative impacts on the participants. Future research could explore some further aspects of iterative consent processes, such as strategies to best communicate the research process and the participants’ personal data management during and after the study.

Content. YFMs provided positive opinions on the theme of the participatory activities, as well as on the activities themselves. Some highlighted how these helped them familiarising with digital technology’s use and concepts, and how it could be applied for helping others in a similar condition. Additionally, in the

activities, the use of *didactic reduction* and several strategies to encourage reflective *on action*, based on YFMs' feedback seemed to have helped on learning about digital technology's concept and design. Some YFMs suggested the use of digital devices during hands-on activities, and future work could investigate the impact of the combination of 'analogue' and digital tools on the engagement of participants during PD activities.

Set-up. The changed of the study location showed more promising results for YFMs engagement than our previous study (Bustamante Duarte et al., 2018), where activities were done at the school. Also, the insights obtained in this study concerning the importance of teamwork and group discussions back up the observations from McNally, Mauriello, et al. (2017) regarding 'safe design environments' with children on how these promote teamwork and reliability in group mates. In general, the *diverse scales of group set-ups* (e.g. small group discussions, whole group brainstorming space) purposely created for the workshops showed potential on easing collaboration and discussions which encouraged mutual learning, agreement, and YFMs engagement with the activities.

The use of a *common language*, as suggested by Bustamante Duarte et al., 2018 in the activities, is necessary for multicultural PD activities. Though the participants selected German as the main language for the activities, some appreciated the possibility of getting some assistance in their native language. During the study, the presence of the Farsi-speaking researcher had a direct positive impact on the engagement of Farsi speaking participants. This suggests two things: first, that the fact that the researchers' team as a whole had a good command of several languages spoken by the participants (German, Farsi, English, French) has positively influenced the results (even if the exact extent of the impact cannot be quantified); second, that researchers should be aware of the language bias when running PD studies in multicultural contexts. There is no one-language which can enable all participants to express themselves with the same degree of ease. Running the activities using multiple languages, however, is not always practical (e.g. the researchers may not know the native languages of the participants).

Reflective processes on action. The reflective practices *on action* on the side of the facilitators provided them with the opportunity to reflect not only on the activities that were done and on the participants' dynamics and reactions to it. They also contributed to having a critical look into their actions and the character of the research. It presents researchers with the opportunity to re-conceptualise and re-calibrate the nature and direction of the participatory and research processes. As to YFMs, the exact impact of the reflective prompts proposed on the learning outcomes was not examined during this study and could be taken up in follow-up studies.

4.6 Conclusion

While the importance of the notion of ‘safe space’ has been acknowledged, relatively little research in PD has looked into what exactly enables such spaces. The participatory design case study presented in this article was implemented to build an environment which promotes open communication, engagement and knowledge exchange among participants (a ‘safe space’). We collaborated with young forced migrants (YFMs) of school age to co-design digital tools for their use. The case study highlighted that the combination of *ethical practices*, *content*, a considerate (spatial) *set-up*, and *facilitator’s reflective practice* stimulated the engagement, participation and knowledge exchange of YFMs. Our main contributions are an approach that describes how to enable ‘safe spaces’ in participatory activities with young forced migrants as well as its evaluation in a co-design case study. Also, we provide a set of lessons learnt from the case study.

Replicating our case study in other settings (e.g. different countries), with young forced migrants at the beginning of their resettlement phase, would be valuable to advance further discussions on components which facilitate the creation of ‘safe spaces’ during participatory design activities in HCI. Further explorations could also assess how the individual characteristics of participants (e.g. their cultural background or their personal life stories) influence their perception of what constitutes a ‘safe space’.

Discussion

This chapter discusses the potential implications of this work in several areas. First, it reflects on how the findings on forced migrants' context in Münster can impact the development of digital services with and for this community (Q1). Second, it reviews the role and potential of participatory approaches to support young forced migrants upon arrival and in the initial phases of (re)settlement while developing such digital services (Q2). Thirdly, it considers the impact of this thesis' findings on PD theory in HCI when working with this particular community (Q2). Afterwards, the limitations of this thesis will be introduced, and its generalizability discussed. Finally, the summary section of this chapter will present the conclusions and potentialities for future works based on this thesis results.

5.1 Forced Migrants Context and Mobile Digital Technologies

The existence of mobile digital devices and services, as suggested in previous chapters, has impacted forced migrants' displacement in its distinct phases, i.e., *pre-flight*, *flight*, and *arrival* (UNHCR, 1999). The first months of their arrival in host cities, such technologies and services open new ways for forced migrants to interact with the host communities and their cities. For instance, they have impacted how diverse types of information are accessed in those circumstances by forced migrants (AbuJarour and Krasnova, 2017; Andrade and Doolin, 2016). Also, these technologies and services have the potential to address some of the needs of forced migrants, along with the challenges they face during these stages (Schreieck et al., 2017; Kutscher and Kreß, 2018; Kutscher and Kreß, 2016; AbuJarour and Krasnova, 2017; Andrade and Doolin, 2016; D. Brown and Grinter, 2016). However, their use, as it brings opportunities also has shortcomings and drawbacks which need to be addressed.

To address such issues in the development of digital services with forced migrants, it is first needed to understand the context of these communities (challenges, needs, expectations, experiences). The present section contributes to this matter by focusing

on the discussion of how the research question 1 (Q1) of this thesis was addressed. It discusses the first part of it which relates precisely to this topic, *What are the challenges forced migrants face along with the needs they have upon arrival and during the first stages of their (re)settlement in their host cities?*.

In order to answer this, a qualitative study was done in Münster with forced migrants and relevant actors who support them in their arrival and first stages of (re)settlement in the city. Chapter 2 of this thesis presents the results and discusses them. Specifically, it describes a set of identified challenges faced by forced migrants, as well as their needs and their information sharing practices when arriving in Münster. The insights gathered corroborate some findings from previous research in HCI and IS, but also expand the available literature on forced migrants' context and the role of digital services upon arrival and first stages of their (re)settlement. They specifically contribute to HCI literature on forced migrants' context (challenges and needs) in host cities by identifying three novel aspects of it. The first one refers to the difficulties some forced migrants have when using geospatial services during these stages of their involuntary displacement. Second, the importance of the type of information visualization when displayed on mobile devices such as smartphones, to enable effective communication. Third, it highlights the need for mobile digital services which count with information that is up-to-date and reliable.

Additionally, the results in Chapter 2 point to four strategies for information access and frequently sharing present in the forced migrants' communities in Münster in their *arrival* phase. Prior research in IS and refugee studies had also defined three of these strategies. However, a fourth (and less frequently mentioned) category emerged through some of the participants' narratives. It refers to those forced migrants who, due to all the challenges they confront, prefer to do not rely on other actors for accessing information. They manifest feelings of fear and anxiety when asking other forced migrants, institutional actors, or local community for information. An issue which seems to be accentuated by the presence of challenges such as limited local language proficiency, potential cultural shock, and unfamiliarity with the host community. The above set of identified challenges and needs of forced migrants informed the exploratory survey of 36 mobile digital applications for or used by forced migrants. This survey helped to answer the second part of Q1 presented as well as part of Chapter 2 of this thesis.

This second part asked, *What is the role of mobile digital services in addressing these?*. This thesis contributed to this question by identifying three core elements to enhance mobile digital services for forced migrants. The first element speaks of the need for multilingual features on both content and user interfaces (UI) in such services to address diverse communities of forced migrants. The majority of the services were addressing mainly Arabic speaking communities since they are

the largest demographic group of forced migrants arriving in the EU during the last years. However, other forced migrants from countries such as Afghanistan, Eritrea, South Sudan, and the Democratic Republic of Congo, have also been arriving in the EU in the last years. Second, the importance of creating mobile services which are fully operational on offline mode due to the particular conditions forced migrants have on the *arrival* stage. Third, the development of collaborative features within the mobile services to address other issues such as information timeliness and reliability. It was proposed to address this in these services by promoting and using the full potential of the already existing information sharing strategies of forced migrants.

Overall, the insights for both parts of Q1 presented in Chapter 2 leave us with exciting paths to move forward the research in HCI with forced migrants. For example, although the identified challenges and needs of forced migrants upon arrival and during the first stages of their (re)settlement cannot be “fully addressed” by mobile digital technologies and services, some can be eased by the use of these. Adaptations are needed in several of the currently available mobile digital services to address key issues which hinder their use by these communities. In the first place, it is suggested based on the results of the study, to transform the process of design and development of these services towards a more collaborative process which reflects the diversity inherent to the forced migrants’ groups. Involvement and participation (e.g., user-centered design (UCD), participatory design (PD)) can become key on promoting an effective transfer of the results from the collaborative processes in the design and development phases into the final product of the service. Some aspects to consider are related to their cultural background, their various and different needs, challenges, expectations, educational backgrounds, among others.

Further studies in HCI are encouraged to explore the use of UCD and PD, for example, for the improvement or even generation of spin-offs of services from the frequently used mobile digital services by forced migrants such as Google Maps or Google Translator. This way, mainstream mobile digital services can answer the particular requirements of these communities for usability in their context. It can also be extended to include or adapt features on mobile digital services explicitly developed for forced migrants such as Ankommen. Also, the generation or improvement of services for language learning, and instant translation, as well as for familiarization with the host community and city, and to access relevant information to carry out their daily life activities are needed. Several studies can be done on the design and development of mobile digital services which can help on advancing some of such challenges and needs of forced migrants.

Collaboration as a topic can also be explored in future HCI research not only in face-to-face UCD and PD processes but as a built-in part of the various mobile digital services for forced migrants. These could offer as part of the services’ features

for enabling user-to-user communication as ways to provide information and take advantage of the recognized information sharing and communication strategies of these communities. It could also include crowd-based features for data collection and curation as a way to have information which is selected by forced migrants as relevant. This strategy could allow having more human sources available which can ease the process of keeping up-to-date information as part of the service, as well as to enable data transparency which can impact its reliability positively. The addition of such features can also ease the participation of these services not only of forced migrants but also of relevant actors supporting them during various stages of their involuntary displacement process.

In the study presented in Chapter 2 could be seen that the majority of the services available were clustered in three main themes. One was constituted by the services dedicated to language learning. Forced migrants used these to learn the language of the host country. Another theme corresponded to the services which ease the communication between forced migrants and the host city inhabitants by providing translation resources. Moreover, a final one was related to the provision of information on the procedures related to asylum requests and daily life in the host cities. Duplication of the services offered by the mobile applications was frequent (e.g., several services were available for Germany to provide information on the host cities and processes to be followed by forced migrants). Very few of the duplicate services had their codes as open-source or the data collected as part of its primary content in an open format. However, some of the duplicated services were presenting problems with maintenance or providing up-to-date information. To promote these further investments or grants for developers of services mainly done for forced migrants should be encouraged. A rise of more open-source services might help on keeping services constantly maintained and enhanced and diminished some of the duplications. It can also, by enabling collaboration of different actors, help on improving their quality (e.g., keeping the information up-to-date), along with adapting them to different locations and communities and maintaining them.

Furthermore, when considering to have the data of these services in an open format, a detailed assessment of privacy matters should be done first. Some mobile applications, mainly mobile geospatial services are location-based. It implies that some of them might be recording the user's location when using it. Location data has been classified in the new EU's General Data Protection Regulation (GDPR) (European Parliament, 2016) as personal data. For the general public, data privacy is a matter of high relevance. It becomes even more crucial when talking to people in vulnerable situations such as forced migrants. Therefore, a careful assessment on which data sets can be open (e.g., translated sentences, a database with recommended places in the host city) and which not (e.g., location history) for helping other developers on improving their services with and for forced migrants is crucial.

Such recommendation is also given to developers of the services to be aware of and take care of the way their services are handling location data, and in general, all forced migrants' private data. The GDPR (European Parliament, 2016) can be followed to advance these services in this direction.

5.2 PD+PR: A PD Adaptation with Young Forced Migrants

As discussed in the previous section, participation has the potential to support forced migrants in their arrival and (re)settlement phases. In the specific case of PD, it enables ways to create or enhance mobile digital services together with forced migrants which can better answer their challenges and needs. For example, as discussed in Chapter 3, PD's intrinsic characteristic on promoting mutual learning (Muller and Druin, 2012) presents us the possibility of opening spaces for collaboration and communication between forced migrants and other relevant actors. The current section concentrates on answering research question 2 (Q2) of this thesis, *How can participatory design be adapted to design mobile (geospatial) services with young forced migrants?*

To answer this research question, the author did first an assessment of PD which identified potentialities and possible drawbacks when used in HCI projects with young forced migrants which can be found in Chapter 3. Also, Chapter 3 presented an exploration to adapt PD by combining it with participatory research (PR). Combining PD with other participatory approaches such as PR widens the options for bolstering the presence of forced migrants' diverse voices in the research process. For example, PR's definition of levels of participation (M. Wright et al., 2010) helps with facilitating engagement at an intensity each comfortable for each participant. It also allows the generation of research projects which are more relevant for the target community. Based on the insights from the case study where PD+PR were applied, several lessons learned were provided along with recommendations at a theoretical and a practical level for PD in HCI with this very diverse group. These findings extended HCI literature on participatory design with young forced migrants in several aspects regarding PD theory as well as practices.

Concerning theory, in Chapter 3 several reflections were introduced based on the PD+PR combinations. However, in this section, the author will discuss only three reflections which have the most potential for the HCI field. Such adaptations are:

- The inclusion from PR of M. Wright et al. (2010)'s model on levels of participation proposes to include, not only a variation for the codesign process but also a way to impact the initial research done with this particular community through face-to-face activities not yet mediated by the technology. It helped

on advancing the discussion proposed by Vines, Clarke, P. Wright, et al. (2013) on the *forms of participation* in HCI projects. Specifically, it helps to analyze the diverse levels of engagement (Vines, Clarke, P. Wright, et al., 2013) in research projects with young forced migrants in a face-to-face setting.

The combination PD+PR, and the discussions on levels of participation in PR helped on the understanding of the role of young forced migrants as co-researchers in the PD process. In this way, they were not only partners during the co-design process of the mobile services, but their participation (input and actions) changed the research project (its objectives, questions, planning) and its final result.

- The premise of “PD to create useful systems” (C. Dantec and C. DiSalvo, 2013) does not necessarily allow participation of all relevant actors in some situations. Young forced migrants’ initial stages of (re)settlement is a complex process for all actors involved. The new encounter spaces created to promote participation and collaboration exposed tensions between actors. As suggested in Chapter3, the exploration of a mediated “Agonistic PD” (Björgvinsson et al., 2012) approach could be further investigated in participatory HCI projects where young forced migrants are participating as a way to support them in their (re)settlement.
- The focus on “safe spaces” in PD processes in HCI with young forced migrants to enable participation and promote engagement with young forced migrants in tech-related projects during their (re)settlement. “Safe spaces” is a notion introduced in this thesis as a result of the combination of PD with PR’s principles. Some prior work in PD and HCI has discussed it (Hourcade, 2017; McNally, Mauriello, et al., 2017; Bertel et al., 2013). Nonetheless, thorough discussions on it and its potential role in PD research with diverse vulnerable or marginalized groups are limited. In Chapters 3 the concept of “safe spaces” is introduced.

Regarding PD practices, this thesis suggests the inclusion of some methods and some adaptations to tailor them in HCI projects with young forced migrants to support them upon arrival and in the first stages of their (re)settlement (see Chapters 3 and 4). One of the most important ones refers to, for example, the careful planning and implementation of an informed and responsible “flexibilization” of ethics procedures. Another practice suggestion mentions the use of didactic reduction (from the field of education) as a strategy to ease communication of tech-related topics and presentation of the research aspects. Lastly, a core insight in this

matter was the importance of combining PD with PR to bring into a PD case study a co-research approach with young forced migrants on mobile digital services.

Overall, the suggestion on PD theory and its practices derived from the case study presented in Chapter 3 allows to re-imagining PD in HCI in the context of young forced migrants. It is shown as an opportunity to open direct spaces for understanding better their context and for transforming design and research accordingly. PD is also seen as an opportunity for promoting intercultural exchanges between communities of locals and young forced migrants (as newcomers) by enabling interaction, communication and collaboration. These intercultural exchanges were assessed as valuable to them by young forced migrants in this research. Further research on this matter can explore the potential of such exchanges in a PD process to support young forced migrants' integration in host communities by easing empathy between groups through the development of intercultural competence (Deardorff, 2006) among them.

5.3 “Safe spaces” and Young Forced Migrants

“Safe spaces” were introduced in Chapter 3 of this thesis and briefly discussed in the previous section. They were further investigated on what they are and how can we enable them on a PD project in HCI with young forced migrants in Chapter 4 of this thesis. The insights gained helped to answer Q2 of this thesis further, *How can participatory design be adapted to design mobile (geospatial) services with young forced migrants?*. The concept of “safe spaces” is seen as one of the core notions in this thesis of such adaptation.

In the case study presented in Chapter 4, a theoretical approach to promote “safe spaces” was proposed and assessed. It contributed to the limited discussion in PD in HCI (McNally, Mauriello, et al., 2017; Hardy et al., 2016; Gram-Hansen and Ryberg, 2016; Jorge, 2001) on the characterization of “safe spaces/environments”, their role, and their potential, particularly with vulnerable communities. The theoretical approach of this thesis provided a definition on “safe spaces” where these are defined as environments for promoting open communication, engagement and knowledge exchange among participants. Such a definition is inspired by a combination of PD and Education concepts. Moreover, the proposed approach presented in Chapter 4 suggested four components to enable them (1) ethics, 2) content, 3) set-up, and 4) reflective practices), and has an initial assessment of its potential on participatory HCI projects with young forced migrants. It also proposed three criteria 1) the engagement of YFMs, 2) their trust building with the facilitators, and 3) their comfort level during the participatory activities, which acted as proxy measures of such spaces.

“Safe spaces” were found to be of interest for conducting participatory HCI research with young forced migrants to promote their engagement actively. These spaces have the potential to promote reflective practices (Schön, 1983) not through controversial or uncomfortable spaces that do not account for their level of vulnerability as proposed in education (Gayle et al., 2013) during the first iterations of the participatory activities. Further research can explore if in the long run, “safe spaces” with young forced migrants should aim for various means to directly promote more conflicting or critical discussions in longitudinal participatory HCI projects with these groups. This suggestion is made considering to have more effective practical results on the development of systems which can support them during their (re)settlement. Also, explorations on how the notion of “safe spaces” despite being different from person to person can be extended to generate a common basis which does not only applies for face-to-face participatory spaces but can also be transferred on spaces mediated by digital technology.

Lastly, the case study introduced in Chapter 4 mentioned some learning aspects (content and material) of the “safe spaces” briefly. However, no further assessment was done in that specific case study, due to time restrictions, on their impact on learning processes with young forced migrants. Thus, further explorations in participatory design for learning can be done on how these spaces can ease the learning of tech and design-related content for these highly diverse communities through participatory activities. Such aspect could be explored further to advance on topics of digital literacy with this particular community while this group advances in education by achieving intercultural competency, and three core competencies of sustainable development (*envision change, achieving transformation, and holistic approach* (UNECE, 2012)). The learning, as well as the improvement in the above competencies, are aspects which might support YFMs during their arrival and (re)settlement in a (previously) unfamiliar host city.

5.4 Managing Ethical Issues in Participatory Processes with YFMs

Ethics have been an important point in the research agenda of HCI researchers working with communities of forced migrants (Talhok, Bustamante, et al., 2018). As reflected in Chapters 3 and 4, *ethics* are considered one of the core aspects of the research conducted and shown on this thesis. It is a highly complex aspect to consider when co-designing digital services with young forced migrants. Several aspects were dealt on this area, but the main reflections and recommendations refer to 1) the use of iterative informed consent process, 2) the use of layered-up consent

agreements, and 3) conducting research which brings reciprocal benefits to the communities taking part on it.

Concerning the first aspect, during the case studies conducted as part of this thesis, an iterative informed consent process as suggested by Mackenzie et al. (2007) and Nguyen et al. (2013) was seen as the most suitable approach for ethics to follow with young forced migrants. This iterative informed consent process had to main steps. First, to meet several times with the potential participants and progressively provide each time with more details, in a comprehensible way, of all the research project details. Such decision was taken due to the presence of some complex aspects of the research project which might not be adequately communicated through to the participants in only one meeting. Particularly, the understanding of the research goals, activities related, and the possible impact (positive and negative) these along with the results of the research would have for them. Second, the case studies conducted also followed in each meeting with the young forced migrants, to state in a precise manner their rights as participants. The author did particular emphasis on their rights to withdraw their consent and not to continue taking part of the research without further explanations to the researcher and to openly express whenever they feel uncomfortable with any action or aspect of the research. Flexibility was encouraged in this process to accommodate the research to the specific circumstances which emerged from working with these groups of young forced migrants. Nonetheless, such flexibility cannot be at the expense of the recommendations mentioned above.

Some of the circumstances which needed to be addressed during the implementation of this thesis' case studies (Chapters 3 and 4) were related to:

- The fact of working with groups of young forced migrants where many of them were unaccompanied minors with assigned legal tutors in Germany upon arrival.
- The large diversity of languages of the group of young forced migrants. Together with a limited/basic proficiency in the host community language generated communication setbacks which needed to be addressed.
- The participation of some young forced migrants who had limited functional literacy.
- The presence of a female participant who was a minor and wanted to be part of the activities but did not have the support of her father to do so.

In regard to the second aspect, the use of layered-up consent agreements had as the primary goal to promote an ethical process which generated agency and empowerment of young forced migrants regarding the management of their data in the research project. It was inspired on the “dynamic consent” concept (Kaye et al., 2015). An initial exploration, with an example, where participants could provide consent for participation in the workshops but not for the recording of the activities through pictures was done. The preliminary observations reflected that it had a positive reaction by participants and that it has the potential for achieving the goal proposed but not conclusive results in this regard could be drawn from the case study. Future explorations on this matter when conducting participatory HCI projects with young forced migrants can be done to evaluate if this approach works for more flexible and personalized ethics procedures. Perhaps such investigations can also assess if other layers on the consent agreement related to other types of personal data (e.g., audio recordings, signatures, or location history) need to be added to this process. Also, one of the principal questions was regarding how to guarantee still that the research and the consent process came across in a precise and transparent manner and that each of the corresponding layers was understood.

Additionally, it was one of the primary drivers of our work to provide a research project that had reciprocal benefits (Mackenzie et al., 2007) for the young forced migrants who were participating in it. This driver permeated all the activities carried out in this thesis. It has its most profound discussion and impact in this thesis as part of the work presented in Chapter 4 on “safe spaces” in participatory HCI with young forced migrants. As part of promoting reciprocal benefits, activities for supporting knowledge content exchange were actively promoted and embedded as the core of the participatory workshops. This act as an initial step towards the inclusion of “safe spaces” as spaces where the learning of design and tech-related concepts is fostered in communities of young forced migrants.

Lastly, many of the aspects defined above, as well as in Chapters 3 and 4, can serve as ways to address some of the issues stated on the co-authored feature article Talhouk, Bustamante, et al. (2018) based on the experiences of HCI researchers working with communities of refugees. The first defined issue related to the ownership of the research data and the technology generates. The second one referred to the question of how the research being conducted is beneficial for these communities?. The third aspect was concerned with the researchers’ self-assessment. The last issue related to defining which are the adequate ways to “navigate the micro and macro politics” which are in play when conducting research related to forced migration.

5.5 Mobile Geospatial Services to Support Arrival

This section focuses on the two open-source mobile geospatial prototypes which were done to provide practical outcomes to support forced migrants in their *arrival* stage. The prototypes here generated were informed by the insights provided by participants of these communities on the study presented in Chapters 2, and 3.

The initial focus was on the development of mobile geospatial services. The results from the semi-structured interviews held with forced migrants as well as with social workers and staff members at the collective accommodations for these communities in Münster pointed in this direction (Chapter 2). Also, previous research (Kutscher and Kreß, 2016; AbuJarour and Krasnova, 2017; Baranoff et al., 2015) mentioned the use of mobile navigation services as one of the critical services for this community upon arrival and some stages of (re)settlement. Furthermore, the insights gained during the participatory workshops reported in Chapter 3 of this thesis allowed to move forward on the co-design process of such tool from the young forced migrants' perspective. Through all of these actions, the main goal was to identify the preliminary characteristics of mobile geospatial services to support forced migrants' navigation and recognition of an unfamiliar urban environment upon arrival. Two open-source prototypes were done based on these insights.

The first prototype was aimed to work more like a mobile geospatial guide to introduce some features of the new host city structure to the forced migrants' communities. It also expected to introduce places and routes which were of importance for these population groups upon arrival. These new places were used to relate to them certain keywords in their native languages as well as in the host community's language to support familiarization with the host communities culture. A set of requirements was defined based on the results of the first semi-structured interviews. The main requirements are:

- The use of graphical user interfaces (UI) which had a minimal amount of text. If it was imperative to add text to the visualization, then this would be displayed with an image which conveys its meaning through the augmented static visualization. The latter was selected as the main visualization method to be able to provide visual images which help with spatial orientation as well.
- The UI needed to content interactions (e.g., swipe-right, swipe-left to advance or go back), icons (e.g., home icon, arrows to move back and forth), and organizations (e.g., their temporary collective accommodation, the immigration office, the social welfare office) which were familiar to forced migrants.

- The use of map-picture combination was encouraged to help with the previously identified challenge related to the complexity of information due to the type of visualization.

The results from the case studies presented in Chapters 3 and 4 also informed the second prototype. It was done as a location-based service (LBS) to facilitate spatial familiarization with the host city based on Spatial Knowledge Acquisition (SKA) (Kochar, 2016). The idea was to create a less “task intensive” () system which does not engage the user at all times, thus enabling the possibility of growing more spatial awareness on its users. A feature that is ideal for the group of forced migrants when aiming to promote their spatial familiarization with an unknown urban environment. The proposed prototype proposes a spatial visualization for navigation which combines augmented reality (AR) with maps (AR+Map). AR has been mentioned to be preferred to be used when the user is standing (Mulloni et al., 2011). This, together with the idea of not engaging forced migrants users all the time with the navigation system, to ease SKA, pointed to display augmented views only in navigational decision points (Kochar, 2016). Such prototype was tested with ten forced migrants between 16 to 27 years of age. All were native Arabic speakers and medium to low proficiency in the German and English languages. Only two participants were familiar with AR, and all participants had smartphones. The study was done in Münster and had two conditions, navigation with only a map view (MView), and another condition using Map+AR. Participants were assigned a condition and asked to reach the destinations indicated by the interface. An online questionnaire was provided to them at the end to ask if they recognized the landmarks and the street names there provided which were drawn from the route done. The results of this study can be seen more in detail in Kochar (2016). The most significant results of the study showed a completion rate of the tasks for both conditions (MView and Map+AR view) was 100%, and only in the MView, two out of five participants of, the took the wrong exit in a roundabout. Such error was not present for participants of the Map+AR view. Also, in terms of acquisition of landmark knowledge, the results indicated that participants who used the Map+AR view recognized more landmarks and identify street names correctly. Regarding route knowledge, all participants who used Map+AR view on their way to the destination point were able to go back to the starting point recalling their way correctly. Instead, two out of five participants using MView were not able to go back to the starting point without additional guidance.

These exploratory results for this prototype help on advancing Q1 of this thesis, particularly about the role of mobile geospatial services in supporting forced migrants during their *arrival* phase. They highlight the potential of navigation services built on Map+AR views to ease the SKA of forced migrants upon arrival to host cities by assisting the progress of forced migrants’ process of gaining landmark and

route knowledge. Further studies are suggested, in particular on spatial cognition research, on the specific components that the augmented guidance layer should have to promote SKA. Additionally, future explorations could be done on combined augmented views, Map+AR or static augmented images plus maps, to enable faster SKA in forced migrants arriving in unfamiliar environments. Furthermore, these future research could consider the addition to these combinations of other resources for information visualization (e.g., audio guidance in native language) which were also mentioned by some forced migrants participating in the activities. All of these potential investigations could help on the development of mobile geospatial services which could assist forced migrants, but also newcomers arriving to host cities to live (either temporarily or permanently).

5.5.1 Technical Aspects of the Prototypes' Development

This subsection provides an overview of the technical aspects of the development of the prototypes described above, for the readers interested in the open-source prototypes source code.

The first prototype for forced migrants was implemented using Apache Cordova (a framework for developing mobile apps for different platforms with web technologies such as HTML and JavaScript (see <https://cordova.apache.org/>), and AngularJS (a framework that simplifies the development of single-page-applications see <https://angularjs.org/>). These mobile geospatial services are yet to be tested with several participants since only one pilot testing has been done. The second prototype was done using Skobbler Maps' software development kit (SDK) which is built on OpenStreetMap (OSM). It was used to generate the 2D maps and to support the development of the real-time navigation functionality. The Camera2 API of Android was used to open and connect all the necessary camera services from the Android smartphones. Also, to diminish the possibility of interfering with the quality of the image due to irregular GPS signal the *android.location* package was used. The OpenGL ES 2.0 was used for augmenting the guidance layer on the camera, and the in-built Android function *getRotationMatrix()* was used to calculate the direction where the camera was being pointed at. All decision points and routes were stored using a JavaScript Object Notation (JSON) format on a Not Only SQL (NoSQL) database. Geofences triggered the Map+AR view in the decision points. The initial basic UI of the service, to recur to familiar features in navigation services had two main buttons: a *position me* and a *calculate route*. The latter displays a *start navigation* message after the route is calculated. The codes for all prototypes are available at the GitHub repository: <https://github.com/geo-c/>.

5.6 Limitations and Generalizability

The present thesis focuses on the role of participatory approaches to support the design of mobile digital services with forced migrants for their arrival and first stages of their (re)settlement in a host city. The main limitations of this research were:

- *Localized and context-dependent results.* The research was done through a qualitative research approach with all case studies, and interviews carried out in the city of Münster, Germany. Such characteristics might have impacted the results presented in this thesis. However, some of the insights obtained confirmed prior findings from researchers in other locations with similar qualitative approaches. Hence, this thesis results' contribute, if taken as a triangulation strategy, to the generalizability of those previous findings (see Chapters 2, 3, and 4).

Nonetheless, other insights obtained in this work were limited represented in previous research for which future explorations are encouraged in these aspects. For instance, the role and impact of “safe spaces” in participatory HCI with young forced migrants can be further investigated as motors for engagement, and trust building in these type of projects. Also, one of this thesis findings pointed to the frequent use of mobile geospatial services by forced migrants' during arrival and (re)settlement. Additional research is suggested on how these services can be used to ease their access to information during such stages and to help them familiarize with the host city and its community.

- *Use of a common language for the activities.* The main languages in which the activities were planned and executed were English and German. These languages were selected either because for one group it was the languages where all (and not only some) participants had some degree of proficiency and allowed to create a shared communication basis. Nonetheless, other factors also impacted this decision. First, the restricted time available for the research. Second, the high levels of complexity of participatory group set-ups with a widely diverse group of young forced migrants. They were diverse in countries of origin (Syria, Afghanistan, Eritrea, Guinea, Iran, Iraq, Nepal, Somalia, Albania, and Nigeria) educational, social, and cultural backgrounds. Third, the use of interpreters for each of the diverse native languages was discarded since not effective ways to control and assess the potential biases they could

have introduced into the research. Also, their presence might have impacted the group dynamics of such multicultural communities negatively during the participatory workshops since their everyday communication exchanges at school at school occurred in German (a language they were learning, and it was common for all).

- *Limited number of participants in a restricted time frame.* The research activities conducted in this thesis had between 10 to 27 participants in different moments in time. The participatory workshops were carried out for time periods of two weeks to a month. After, each of the activities the researchers kept in contact with the participants of the workshops. However, the actual duration of both rounds of the participatory activities was mentioned by several young forced migrants as an aspect to improve. They highlighted their interest on making the activities longer in time to “*learn more*” and “*work more in groups*”. Also, the involvement of adult forced migrants was limited to a group of ten participants who were between 22 to 46 years old, and they were only part of this thesis the semi-structured interviews presented in Chapter 2. In general, the contact and engagement of adult forced migrants represented many difficulties which were not able to be fully overcome through this research.

This research has several limitations as presented above, and reflected in more detail in Chapters 2, 3, and 4. However, several of these limitations can be common to several HCI projects researching with forced migrants. The present thesis documented in detail each of the strategies used to address such limitations. Also, it reported in-depth on the reflections gathered from their implementation and assessment in participatory HCI project with young forced migrants. Furthermore, additional recommendations on practices for participatory design projects with young forced migrants were suggested through the various Chapters of this thesis. All of these reflections and recommendations can help to inform other researchers in the field conducting similar research projects.

Furthermore, this thesis provided some theoretical contributions. However, despite several of these contributions (e.g., the concept of “safe spaces”, the use of iterative informed consent process) were gathered on a localized research project, they might be transferable to PD research in HCI with young forced migrants communities in other locations and cultural contexts. Nonetheless, further investigations are encouraged to trigger further discussions and inform future projects concerning PD theory and practice in HCI with young forced migrants in a (re)settlement situation.

Conclusion and Outlook

Through the various chapters of this thesis diverse aspects regarding forced migration, participatory design, mobile geospatial services, and arrival and (re)settlement context in host cities were explored. Although the results of this thesis may not be generalized to all forced migrants worldwide, they can provide useful insights for practitioners and researchers. Particularly, for those focus on conducting HCI-related projects with young forced migrants when designing and researching digital technologies through participatory approaches.

The specific contributions of this thesis can be summarized as follows:

- Contribution 1- Identification of a set of challenges and needs of forced migrants upon arrival in Münster, Germany. It was complemented by the results of an exploratory assessment of currently available mobile digital services based on the previous set of challenges and needs. The results pointed to aspects which needed to be improved for these services to answer to the forced migrants' context upon arrival in Münster (see Chapter 2).
- Contribution 2- Recommendations for theoretical and practical adaptations for participatory design (PD) in HCI (see Chapter 3). These were done combining PD with PR key principles (i.e., safe spaces, levels of participation, the role of participants) to reflect upon current PD practices and methods for co-designing mobile digital technologies. The goal of the adaptations was to promote young forced migrants' participation during the co-design process.
- Contribution 3- A theoretical approach to enable “safe spaces” in participatory HCI with young forced migrants. Four components to enable these type of spaces and three proxy measures were suggested. Overall, it is seen as an approach which increases the understanding of PD's theoretical components for participatory projects in HCI. It contributes to the limited available discussion in HCI on how participatory strategies ensure dynamics where participants feel motivated to speak, not judged and are encouraged to engage in co-design processes. As reflected in Chapter 4, the process of enabling ‘safe spaces’ is particularly encouraging in this scenario.

- Contribution 4- Two open-source mobile prototypes of augmented geovisualizations to support information access and spatial familiarization of forced migrants upon arrival in their host cities (see Section 5.5).

The context of forced migrants in their *arrival* to host cities is complex and can be impacted by diverse factors. Various challenges and needs were corroborated during this study, from the ones defined by previous research, while others emerged as a result of this work as seen in Chapter 2. One of the major takeaways of this thesis is that participatory HCI opens up different opportunities to young forced migrants upon arrival and during the first stages of their (re)settlement. Such opportunities transcend the co-design process and generate for possibilities for co-researching with participants, as well as promoting social and intercultural exchanges between host communities and forced migrants in these scenarios. “Safe spaces” were also introduced as a way for participatory HCI to promote open communication, engagement and knowledge exchange among participants, particularly young forced migrants. Chapters 3 and 4 of this thesis present reflections on this area.

In terms of future work, it is clear that there is a need for further studies on several of the topics of this thesis due to its exploratory nature. Some future research has already been suggested through the various chapters that compose it as well as through this Discussion Chapter. The following thesis outlook aims to present the reader with possibilities for extending the topic that is beyond the current thesis scope. Future research is suggested on the field of participatory HCI for fomenting a dynamic learning process among communities of young forced migrants. It can be on the use of a combination of the PD+PR approach, “safe spaces”, and augmented visualizations to promote farther engagement, more effective processes of technology development, and the promotion of achieving competencies. The insights in this thesis (as seen in Chapter 3) lit a light on the potential of this combination to enable intercultural and sustainable development competencies on young forced migrants during their (re)settlement. Also, it might have the potential to improve digital literacy on some members of these communities easing their use of and improving their awareness of existent technologies. The combination above could level the ground for both groups for self-identification with the other’s experience and move forward to a more effective and bidirectional social integration.

On a similar line, explorations are also suggested on how augmented visualizations and experiences could mediate the transition period of forced migrants during the *arrival* stage by helping on the process of familiarization with the host city and its community. These can be through mediated indoors or outdoors (public spaces) which extend forced migrants’ safe and familiar space upon arrival to farther, and less familiar parts of the host city. It can move around the idea of creating a perception of the unknown urban parts as “known and familiar” before actually engaging with

a face-to-reality interaction. Additionally, further research on assessing and adapting PD in HCI projects with young forced migrants for integration contexts on the lenses of postcolonial research can be beneficial for (re)conceptualizing this thesis' findings. It could build a more sensitive approach to address participatory group set-ups with the culturally diverse members of these communities while effectively codesigning a system to support them in their arrival and (re)settlement. Lastly, further recommendations are done on conducting research which is longitudinal character along with studies conducted with larger groups of young forced migrants' coresearchers and in diverse locations to be able to widen the understanding of this topic.

The contributions and discussions held in this thesis, help to advance the current on-growing discussion in HCI with young forced migrants. More clearly, advances on the specific topic of participatory HCI with this highly diverse group. The contributions and discussion here, are the result of a transdisciplinary research approach, which combines PR, PD, Education, Geoinformatics, and HCI. This thesis can serve other researchers and practitioners as a document to discuss PD, the role of "safe spaces" in Participatory HCI, and the co-development of technologies with young forced migrants. It can also serve to promote critical reflections on the what is the "actual role" of PD when confronted with situations where is not only needed to design a system but to support participants in their personal development and life situations. Overall, this thesis makes a strong case for igniting further discussion on the use of participatory approaches for enabling more inclusive host cities for forced migrants.

Bibliography

- Aal, Konstantin, George Yerosus, Kai Schubert, et al. (2014). „Come in Palestine: Adapting a German Computer Club Concept to a Palestinian Refugee Camp“. In: *Proceedings of the 5th ACM International Conference on Collaboration Across Boundaries: Culture, Distance and Technology*. CABS '2014. Kyoto, Japan: ACM, pp. 111–120 (cit. on pp. 5, 6, 21, 40, 56, 95).
- Aarhus, Rikke, Erik Gronvall, and Morten Kyng (2010). „Challenges in Participation“. In: *Proceedings of the 4th International ICST Conference on Pervasive Computing Technologies for Healthcare*. IEEE, pp. 1–4 (cit. on p. 63).
- AbuJarour, Safa'a and Hanna Krasnova (2017). „Understanding the role of ICTs in promoting social inclusion: The case of syrian refugees in Germany“. In: *Twenty-Fifth European Conference on Information Systems (ECIS)*. Guimarães, Portugal (cit. on pp. 4–6, 20, 23, 25, 111, 121).
- Alhumaidan, Haifa, Kathy Pui Ying Lo, and Andrew Selby (2018). „Co-designing with children a collaborative augmented reality book based on a primary school textbook“. In: *International Journal of Child-Computer Interaction* 15, pp. 24–36 (cit. on p. 12).
- Almohamed, Asam (2016). „Designing for the Marginalized : A step towards understanding the lives of refugees and asylum seekers“. In: *Proceedings in Designing Interactive Systems - DIS 2016*. New York, NY, USA: ACM, pp. 165–168 (cit. on pp. 4, 20, 56).
- Almohamed, Asam and Dhaval Vyas (2016). „Vulnerability of displacement: challenges for integrating refugees and asylum seekers in host communities“. In: *Proceedings of the 28th Australian Conference on Computer-Human Interaction - OzCHI '16*. Ed. by Henry B. L. Duh, Christopher Lueg, Mark Billingham, and Weidong Huang. Launceston, Tasmania, Australia: ACM Press, pp. 125–134 (cit. on p. 20).
- Andrade, Antonio Díaz and Bill Doolin (2016). „Information and Communication Technology and the Social Inclusion of Refugees“. In: *MIS Quarterly* 40.2, pp. 405–416 (cit. on pp. 4–6, 20, 24, 25, 55, 111).
- Arnstein, Sherry R. (1969). „A Ladder Of Citizen Participation“. In: *Journal of the American Institute of Planners* 35.4, pp. 216–224 (cit. on p. 49).
- BAMF (2015). *The distribution of asylum applicants* (cit. on p. 56).
- (2017). *Das Bundesamt in Zahlen 2016 - Asyl*. Tech. rep. Bundesamt für Migration und Flüchtlinge, pp. 1–57 (cit. on pp. 4, 8, 19).

- Baranoff, Jenniffer, Israel R. Gonzales, Jay Liu, Heidi Yang, and Jimin Zheng (2015). „Lantern: Empowering Refugees Through Community-Generated Guidance Using Near Field Communication“. In: *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems*. Vol. 2. CHI EA '15. New York, NY, USA: ACM, pp. 7–12 (cit. on pp. 5, 6, 21, 24, 56, 95, 121).
- Barker, John and Susie Weeler (2003). „Is it fun?“ developing children centred research methods“. In: *International Journal of Sociology and Social Policy* 23.1, pp. 33–58 (cit. on p. 101).
- Basten, Thomas, Dominik Conrad, and Dirk Felzmann (2013). „Didaktische Rekonstruktion“. In: *Wörterbuch der Geographiedidaktik. Begriffe von A-Z*. Ed. by Dieter Böhn und Gabriele Obermaier. Westermann, pp. 52–53 (cit. on p. 87).
- BenEzer, Gadi and Roger Zetter (2014). „Searching for Directions: Conceptual and Methodological Challenges in Researching Refugee Journeys“. In: *Journal of Refugee Studies* 28.3, pp. 297–318 (cit. on pp. 5, 55).
- Bergold, Jarg and Stefan Thomas (2012). „Partizipative Forschungsmethoden: Ein methodischer Ansatz in Bewegung“. In: *Forum: Qualitative Sozialforschung* 13.1, p. 33 (cit. on pp. 40, 46–48, 51, 67, 68, 91).
- Bertel, Lykke, Dorte Rasmussen, and Ellen Christiansen (2013). „Robots for real: Developing a Participatory Design framework for implementing educational robots in real-world learning environments“. In: *Human-Computer Interaction*. Ed. by Paula Kotzé, Gary Marsden, Gitte Lindgaard, Janet Wesson, and Marco Winckler. INTERACT 2013. Cape Town, South Africa: Springer Berlin-Heidelberg, pp. 437–444 (cit. on pp. 86, 116).
- Bin Morshed, Mehrab, Michaelanne Dye, Syed Ishtiaque Ahmed, and Neha Kumar (2017). „When the Internet Goes Down in Bangladesh“. In: *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing - CSCW '17*. Portland, OR, USA: ACM, pp. 1591–1604 (cit. on pp. 6, 24, 27).
- Björgvinsson, Erling, Pelle Ehn, and Per-Anders Hillgren (2010). „Participatory design and 'democratizing innovation'“. In: *Proceedings of the 11th Biennial Participatory Design Conference*. PDC '10. Sidney, Australia: ACM, pp. 41–50 (cit. on p. 86).
- (2012). „Agonistic participatory design: working with marginalised social movements“. In: *CoDesign* 8.2-3, pp. 127–144 (cit. on pp. 86, 88, 116).
- Bødker, Susanne (1987). „Through the Interface - a Human Activity Approach to User Interface Design“. In: *DAIMI Report Series* 16.224 (cit. on p. 44).
- (1996). „Creating Conditions for Participation: Conflicts and Resources in Systems Development“. In: *Human-Computer Interaction* 11.3, pp. 215–236 (cit. on pp. 40, 42).
- (2002). „Staging a Professional Participatory Design Practice - Moving PD beyond the Initial Fascination of User Involvement“. In: *Proceedings of the 2nd Nordic Conference on Human-computer Interaction*. NordiCHI '02. Aarhus, Denmark: ACM, pp. 11–18 (cit. on pp. 7, 42).
- (2006). „When second wave HCI meets third wave challenges“. In: *Proceedings of the 4th Nordic Conference on Human-computer Interaction: Changing roles*. NordiCHI '06. New York, NY, USA: ACM, pp. 1–8 (cit. on p. 44).
- (2015). „Third-wave HCI, 10 years later -Participation and Sharing“. In: *Interactions* 22.5, pp. 24–31 (cit. on p. 44).

- Boost Rom, Robert (1998). „Safe spaces’: Reflections on an educational metaphor“. In: *Journal of Curriculum Studies* 30.4, pp. 397–408 (cit. on pp. 93, 94).
- Boud David, Keogh Rosemary and David Walker (1985). „Promoting Reflection in Learning: a Model“. In: *Reflection: turning experience into learning*. Ed. by David Boud, Rosemary Keogh, and David Walker. New York: Kogan Page Nichols Pub, pp. 18–40 (cit. on p. 100).
- Brendel, Nina (2017). *Reflexives Denken im Geographieunterricht : eine empirische Studie zur Bestimmung von Schülerreflexion mithilfe von Weblogs im Kontext Globalen Lernens*. Münster New York: Waxmann (cit. on p. 101).
- Brodie, Ken (2005). „Models of collaborative visualization“. In: *Exploring Geovisualization*. Ed. by J Dykes, A M MacEachren, and M J Kraak. Elsevier. Chap. 23, p. 463 (cit. on p. 36).
- Brown, Deana and Rebecca E Grinter (2016). „Designing for Transient Use: A Human-in-the-loop Translation Platform for Refugees“. In: *Proceedings of the 33th Annual Conference on Human Factors in Computing Systems*. CHI ’16. San Jose, CA, USA: ACM, pp. 321–330 (cit. on pp. 5, 6, 20, 21, 24, 56, 95, 111).
- Brown, Scott Andrew and Petra Gemeinboeck (2017). „Sensory Conversation : An Interactive Environment to Augment Social Communication in Autistic Children“. In: *Assistive Augmentation*. Ed. by J.Huber et al. Springer Singapore, pp. 131–150 (cit. on p. 92).
- Brunwasser, Matthew (2015). *A 21st-Century Migrant ’s Essentials : Food, Shelter, Smartphone* (cit. on pp. 5, 55).
- Bustamante Duarte, Ana Maria, Nina Brendel, Auriol Degbelo, and Christian Kray (2018). „Participatory Design and Participatory Research“. In: *ACM Transactions on Computer-Human Interaction* 25.1, pp. 1–39 (cit. on pp. 21, 91, 93, 95, 96, 99, 107, 109).
- Caidi, Nadia and Danielle Allard (2005). „Social inclusion of newcomers to Canada: An information problem?“ In: *Library and Information Science Research* 27.3, pp. 302–324 (cit. on p. 24).
- Caidi, Nadia, Danielle Allard, and Lisa Quirke (2010). „Information Practices of Immigrants“. In: *Annual Review of Information Science and Technology* 44.1, pp. 491–531 (cit. on pp. 4, 20, 24).
- Camara, Souleymane and Jose Abdelnour-Nocera (2013). „Revealing the Socio-Technical Context of Design Settings: Toward Participatory IS Design“. In: *International Journal of Human-Computer Interaction* 29.4, pp. 289–307 (cit. on p. 40).
- Campbell, Rebecca, Tracy Sefl, Sharon Wasco, and Courtney Ahrens (2004). „Doing community research without a community: Creating safe space for rape survivors“. In: *American journal of community psychology* 33.3-4, pp. 252–261 (cit. on p. 48).
- Carroll, John M. and Mary Beth Rosson (2013). „Wild at home: the neighborhood as a living laboratory for HCI“. In: *ACM Transactions on Computer-Human Interaction (TOCHI)* 20.3 (cit. on p. 40).
- Coghlan, David and Mary Brydon-Miller, eds. (2014). *The SAGE encyclopedia of action research*. Los Angeles, USA: SAGE (cit. on pp. 47, 77).
- Danso, Ransford (2002). „From ‘there’ to ‘here’: An investigation of the initial settlement experiences of Ethiopian and Somali refugees in Toronto“. In: *GeoJournal* 56.1, pp. 3–14 (cit. on pp. 4, 5, 24, 39, 55).

- Dantec, Christopher Le and Sarah Fox (2015). „Strangers at the gate: Gaining access, building rapport, and co-constructing community-based research“. In: *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*. CSCW 2015. New York, NY, USA: ACM, pp. 1348–1358 (cit. on p. 48).
- Dantec, Christopher and Carl DiSalvo (2013). „Infrastructuring and the formation of publics in participatory design“. In: *Social Studies of Science* 43.2, pp. 241–264 (cit. on pp. 85, 116).
- Davis, Elizabeth A. (2000). „Scaffolding students' knowledge integration: Prompts for reflection in KIE“. In: *International Journal of Science Education* 22.8, pp. 819–837 (cit. on p. 84).
- Deardorff, Darla K. (2006). „Identification and Assessment of Intercultural Competence as a Student Outcome of Internationalization“. In: *Journal of Studies in International Education* 10.3, pp. 241–266 (cit. on p. 117).
- Dell, Nicola and Neha Kumar (2016). „The Ins and Outs of HCI for Development“. In: pp. 2220–2232 (cit. on p. 27).
- Dewey, John (1997). Mineola, New York: Dover Publications, Inc. (cit. on p. 11).
- DiSalvo, Betsy and Kayla DesPortes (2017). „Establishing Content Expertise in Intergenerational Co-Design Teams“. In: *Participatory Design for Value-Driven Learning*. Ed. by Betsy DiSalvo, Jason Yip, Elizabeth Bonsignore, and Carl DiSalvo. First. New York: Routledge. Taylor and Francis Group. Chap. 13, pp. 175–188 (cit. on p. 107).
- Donnelly, Alexis (2000). „Towards an Inclusive Information Society : Some Principles from the Margins“. In: *6th ERCIMWorkshop "Uster Interfaces for All"*. October. Florence, Italy (cit. on p. 24).
- Druin, Allison (1999). „Cooperative inquiry: Developing new technologies for children with children“. In: *Proceedings of the 17th Annual Conference on Human Factors in Computing Systems*. CHI. New York, NY, USA: ACM, pp. 592–599 (cit. on p. 45).
- (2002). „The role of children in the design of new technology“. In: *Behaviour & Information Technology* 21.1, pp. 1–25 (cit. on pp. 7, 40, 43, 45, 66, 81, 100).
- Druin, Allison, Ben Bederson, Angela Boltman, et al. (1998). „Children as Our Technology Design Partners“. In: *The Design of Children's Technology: How We Design, What We Design and Why*. Ed. by Allison Druin. San Francisco, CA, USA: Morgan Kaufmann Publishers Inc., pp. 51–60 (cit. on pp. 12, 45).
- Durrant, Abigail and David Kirk (2018). „On ethical responsiveness: Being answerable to others as an HCI researcher“. In: *Interacting with Computers* 30.2, pp. 99–115 (cit. on p. 93).
- Earle, Lucy (2016). „Urban crises and the new urban agenda“. In: *Environment and Urbanization* 28.1, pp. 77–86 (cit. on p. 5).
- Elliott, Susan and Joan Gillie (1998). „Moving experiences: a qualitative analysis of health and migration.“ In: *Health & Place* 4.4, pp. 327–339 (cit. on p. 55).
- European Parliament (2016). *Regulation (EU) 2016/679 of the European Parliament and of the Council - of 27 April 2016 - On the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)* (cit. on pp. 114, 115).

- Fechner, Thore and Christian Kray (2014). „Georeferenced Open Data and Augmented Interactive Geo-Visualizations as Catalysts for Citizen Engagement“. In: *JeDEM - eJournal of eDemocracy and Open Government* 6.1, pp. 14–35 (cit. on p. 36).
- Felt, Adrienne Porter, Matthew Finifter, Erika Chin, Steve Hanna, and David Wagner (2011). „A survey of mobile malware in the wild“. In: *Proceedings of the 1st ACM workshop on Security and privacy in smartphones and mobile devices - SPSM '11*. Ed. by ACM. Chicago, Illinois, USA: ACM, pp. 3–14 (cit. on p. 12).
- Fisher, Karen, Ann Peterson Bishop, Philip Fawcett, and Lassana Magassa (2013). „InfoMe at teen design days: a multi-disciplinary, design thinking approach to community development“. In: *Proceedings of Sixth International Conference on Information and Communications Technologies and Development*. Vol. 2. ICTD '13. ACM, pp. 25–28 (cit. on pp. 6, 20, 40, 45).
- Fisher, Karen, Ann Peterson Bishop, Lassana Magassa, and Phil Fawcett (2014). „Action: codesigning interactive technology with immigrant teens“. In: *Proceedings of the 2014 conference on Interaction Design and Children*. IDC '14. New York, NY, USA: ACM, pp. 345–348 (cit. on pp. 6, 40, 45).
- Fisher, Karen and Katya Yefimova (2016). „'Future ' s Butterflies : ' Co-Designing ICT Wayfaring Technology with Refugee Syrian Youth“. In: *Proceedings of the 15th International Conference on Interaction Design and Children*. IDC '16. Manchester, United Kingdom: ACM, pp. 25–36 (cit. on pp. 6, 12, 40, 45, 56, 95).
- Fisher, Karen, Katya Yefimova, and Ann Peterson Bishop (2016). „Adapting Design Thinking and Cultural Probes to the Experiences of Immigrant Youth : Uncovering the Roles of Visual Media and Music in ICT Wayfaring“. In: *Proceedings of the 34th Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems*. CHI EA '16. Santa Clara, California, USA: ACM, pp. 859–871 (cit. on pp. 6, 40, 45, 56).
- Flick, U., E. von Kardoff, I. Steinke, and B. Jenner (2004). *A Companion to Qualitative Research*. A Companion to Qualitative Research. SAGE Publications (cit. on p. 23).
- Flick, Uwe (2014). *An Introduction to Qualitative Research*. SAGE (cit. on p. 11).
- French, Tara, Gemma Teal, and Sneha Raman (2016). „Experience Labs : co-creating health and care innovations using design tools and artefacts“. In: *Proceedings of DRS 2016, Design Research Society 50th Anniversary Conference*. Brighton, UK, pp. 1–15 (cit. on p. 93).
- Futschek, Gerald (2013). „Extreme didactic reduction in computational thinking education“. In: *Learning While Are Connected* 3, pp. 1–6 (cit. on p. 87).
- Gale, Nathan, Reginald G. Golledge, William C. Halperin, and Helen Couclelis (1990). „Exploring Spatial Familiarity“. In: *The Professional Geographer* 42.3, pp. 299–313 (cit. on p. 77).
- Gayle, Barbara Mae, Derek Cortez, and Raymond Preiss (2013). „Safe Spaces, Difficult Dialogues, and Critical Thinking“. In: *International Journal for the Scholarship of Teaching and Learning* 7.2 (cit. on pp. 94, 118).
- Gemeinsame Wissenschaftskonferenz (2018). *Bekanntmachung des Königsteiner Schlüssels für das Jahr 2017* (cit. on p. 8).

- Gifford, S. M. and R. Wilding (2013). „Digital escapes? ICTs, Settlement and belonging among Karen Youth in Melbourne, Australia“. In: *Journal of Refugee Studies* 26.4, pp. 558–575 (cit. on pp. 5, 21).
- Gillespie, Marie, Lawrence Ampofo, Margaret Cheesman, et al. (2016). *Mapping Refugee Media Journeys Smartphones and Social Media Networks Research Report*. Tech. rep. Research Report. The Open University / France Medias Monde (cit. on pp. 24, 25).
- Gillespie, Marie, Souad Osseiran, and Margaret Cheesman (2018). „Syrian Refugees and the Digital Passage to Europe: Smartphone Infrastructures and Affordances“. In: *Social Media and Society* 4.1 (cit. on pp. 5, 95).
- Gram-Hansen, Sandra Burri and Thomas Ryberg (2016). „From participatory design and ontological ethics, towards an approach to constructive ethics“. In: *ACM SIGCAS Computers and Society* 45.3, pp. 147–153 (cit. on pp. 91, 93, 107, 117).
- Greenbaum, Joan (1991). „Towards Participatory Design: The Head and the Heart Revisited“. In: *DAIMI Report Series* 20.374, pp. 1–9 (cit. on pp. 7, 11, 40, 42–44, 64, 65, 87, 100).
- (1993). „A design of one’s own: Towards participatory design in the United States“. In: *Participatory design: Principles and practices*. Hillsdale, NJ, USA: Lawrence Erlbaum Associates, pp. 27–37 (cit. on p. 66).
- Greene, Sheila and Diane Hogan (2005). *Researching Children’s Experience: Approaches and Methods*. Researching Children’s Experience: Methods and Approaches. SAGE Publications (cit. on pp. 9, 11).
- Groundwater-Smith, Susan, Sue Dockett, and Dorothy Bottrell (2014). *Participatory Research with Children and Young People*. SAGE (cit. on p. 48).
- Guldberg, Karen, Kaska Porayska-Pomsta, Judith Good, and Wendy Keay-Bright (2010). „ECHOES II: the creation of a technology enhanced learning environment for typically developing children and children on the autism spectrum“. In: *Journal of Assistive Technologies* 4.1, pp. 49–53 (cit. on p. 92).
- Halbert, Helen and Lisa P. Nathan (2015). „Designing for Discomfort“. In: *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing - CSCW ’15*, pp. 349–360 (cit. on pp. 93, 96).
- Halskov, Kim and Nicolai Brodersen (2015). „The diversity of participatory design research practice at PDC 2002–2012“. In: *International Journal of Human-Computer Studies* 74, pp. 81–92 (cit. on pp. 7, 41, 42, 44, 45, 47, 50, 56, 85).
- Hardy, Dianna, Elizabeth Forest, Zoe McIntosh, Trina Myers, and Janine Gertz (2016). „Moving Beyond ‘Just Tell Me What to Code’: Inducting Tertiary ICT Students into Research Methods with Aboriginal Participants via Games Design“. In: *Proceedings of the 28th Australian Conference on Computer-Human Interaction*, pp. 557–561 (cit. on pp. 91, 93, 117).
- Harney, Nicholas (2013). „Precarity, affect and problem solving with mobile phones by asylum seekers, refugees and migrants in Naples, Italy“. In: *Journal of Refugee Studies* 26.4, pp. 541–557 (cit. on pp. 5, 21).
- Hashemi, Sylvana Sofkova, Nataliya Berbyuk Lindström, Lorna Bartram, and Linda Bradley (2017). „Investigating Mobile Technology Resources for Integration“. In: *Proceedings of the 16th World Conference on Mobile and Contextual Learning - mLearn 2017*, pp. 1–8 (cit. on pp. 5, 22).

- Hayes, Gillian (2011). „The relationship of action research to human-computer interaction“. In: *Transactions on Computer-Human Interaction (TOCHI)* 18.3 (cit. on pp. 46, 47).
- Henderson, Kate, Ksenija Napan, and Sylila Monteiro (2004). „Encouraging reflective learning: An online challenge“. In: *Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference*. Ed. by D. Jonas-Dwyer & R. Phillips R. Atkinson C. McBeath. Perth, pp. 357–364 (cit. on p. 100).
- Hernandez, M.G., S. Casanova, C. Suarez-Orozco, and C.L. Saetermoe (2013). „Doing no harm and getting it right: Guidelines for ethical research with immigrant communities“. In: *New directions for child and adolescent development*. Ed. by M.G. Hernandez, J. Nguyen, C.L. Saetermoe, and C. Suarez-Orozco. Wiley Periodicals, Inc. Chap. 4, pp. 43–60 (cit. on pp. 9, 70, 71, 85).
- Hershman, Anneli, Martin Saveski, Juliana Nazare, Deb Roy, and Mitchel Resnick (2018). „Light It Up : Using Paper Circuitry to Enhance Low-Fidelity Paper Prototypes for Children“. In: *Proceedings of the 17th International Conference on Interaction Design and Children*. Ed. by ACM. Trondheim, Norway: ACM, pp. 365–372 (cit. on p. 12).
- Hoang, T.Dinh, Lee Chonho, Niyato Dusit, and Wang Ping (2013). „A survey of mobile cloud computing: architecture, applications, and approaches“. In: *Wireless Communications and Mobile Computing* 13, pp. 1587–1611. arXiv: arXiv:1405.1155v1 (cit. on p. 12).
- Holley, Lynn C. and Sue Steiner (2005). „SAFE SPACE: Student perspectives on classroom environment“. In: *Journal of Social Work Education* 41.1, pp. 49–64 (cit. on pp. 93, 94, 96).
- Holone, Harald and Jo Herstad (2013). „Three Tensions in Participatory Design for Inclusion“. In: *Proceedings of the 31st Annual Conference on Human Factors in Computing Systems*. CHI '13. Paris, France: ACM, pp. 2901–2906 (cit. on p. 82).
- Horton, Matthew, Janet Read, Emanuela Mazzone, Sim Gavin, and Daniel Fitton (2012). „School Friendly Participatory Research Activities with Children“. In: *Proceedings of the 30th ACM Conference Extended Abstracts on Human Factors in Computing Systems*. CHI EA '12. Austin, Texas, USA: ACM, pp. 2099–2104 (cit. on p. 40).
- Hourcade, Juan Pablo (2017). „Participatory design with children in the autism spectrum: access, participation, personalization, and sustainability“. In: *Participatory Design for Learning*. Ed. by Betsy DiSalvo, Carl DiSalvo, Jason Yip, and Elizabeth Bonsignore. Routledge (cit. on pp. 86, 116).
- Hussain, Sofia (2010). „Empowering Marginalized Children in Developing Countries Through Participatory Design Processes“. In: *CoDesign* 6.2, pp. 99–117 (cit. on pp. 40, 43).
- IOM (2011). *World Migration Report 2011*. Tech. rep. International Organization for Migration, pp. 1–184 (cit. on p. 3).
- Irani, Azalea, Kriti Nelavelli, Kristin Hare, Paula Bondal, and Neha Kumar (2018). „Refuge Tech : An Assets-Based Approach to Refugee Resettlement qualitative methods“. In: *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*, pp. 1–6 (cit. on p. 6).
- Isenberg, Petra, Niklas Elmqvist, Jean Scholtz, et al. (2011). „Collaborative visualization: Definition, challenges, and research agenda“. In: *Information Visualization* 10.4, pp. 310–326 (cit. on p. 36).

- Jorge, Joaquim a. (2001). „Adaptive Tools for the Elderly - New Devices to cope with Age-Induced Cognitive Disabilities“. In: *Proceedings of the 2001 EC/NSF workshop on Universal accessibility of ubiquitous computing providing for the elderly - WUAUC'01*. Alcaccer do Sal, Portugal: ACM, pp. 66–70 (cit. on pp. 91, 93, 117).
- Joshi, Suhas Govind and Tone Bratteteig (2016). „Designing for Prolonged Mastery. On Involving Old People in Participatory Design“. In: *Scandinavian Journal of Information Systems* 28.1, pp. 3–36 (cit. on pp. 40, 42–45).
- Kaika, Maria (2017). „Don't call me resilient again!': the New Urban Agenda as immunology ... or ... what happens when communities refuse to be vaccinated with 'smart cities' and indicators“. In: *Environment and Urbanization* 29.1, pp. 89–102 (cit. on p. 6).
- Kankainen, Anu, Kirsikka Vaajakallio, Vesa Kantola, and Tuuli Mattelmäki (2012). „Story-telling Group — A Co-design Method for Service Design“. In: *Behaviour & Information Technology* 31.3, pp. 221–230 (cit. on p. 45).
- Kaufmann, Katja (2018). „Navigating a new life: Syrian refugees and their smartphones in Vienna“. In: *Information Communication and Society* 21.6, pp. 882–898 (cit. on pp. 5, 6, 95).
- Kaye, Jane, Edgar A. Whitley, David Lund, et al. (2015). „Dynamic consent: A patient interface for twenty-first century research networks“. In: *European Journal of Human Genetics* 23.2, pp. 141–146 (cit. on pp. 98, 120).
- Kennan, Mary Anne, Annemaree Lloyd, Asim Qayyum, and Kim Thompson (2011). „Settling In: The relationship between information and social inclusion“. In: *Australian Academic & Research Libraries* 42.3, pp. 191–211 (cit. on pp. 4, 5, 20, 23, 24, 28, 55).
- Kensing, Finn and Kim Halskov Madsen (1992). „Generating Visions: Future Workshops and Metaphorical Design“. In: *Design at Work*. Ed. by Joan Greenbaum and Morten Kyng. Hillsdale, NJ, USA: L. Erlbaum Associates Inc., pp. 155–168 (cit. on pp. 11, 44, 64).
- Kensing, Finn and Andreas Munk-Madsen (1993). „PD: Structure in the Toolbox“. In: *Communications of the ACM* 36.6, pp. 78–85 (cit. on pp. 42, 45).
- Kenten, Charlotte (2010). „Narrating oneself : Reflections on the use of solicited diaries with diary interviews“. In: *Forum Qualitative Sozialforschung Forum Qualitative Social Research* 11.2 (cit. on p. 11).
- Kochar, Apurva Anil (2016). „Using Map-Augmented Reality for Forced Migrants“. Master Thesis. University of Muenster, pp. 1–37 (cit. on p. 122).
- Kolb, D. A. (1975). „toward an applied theory of Experiential Learning“. In: *Theories of group processes*. Ed. by C. L. Cooper. New York: John Wiley & Sons, pp. 33–58 (cit. on p. 100).
- Korthagen, Fred and Angelo Vasalos (2005). „Levels in reflection: Core reflection as a means to enhance professional growth“. In: *Teachers and teaching* 11.1, pp. 47–71 (cit. on p. 100).
- Kunz, Alexa Maria and Michaela Pfadenhauer (2014). „One Campus - Many Ways to Go?! A methodological comparison of paper-pencil and electronic logbooks when exploring students' patterns of spatial use“. In: *Journal of New Frontiers in Spatial Concepts* 6, pp. 21–27 (cit. on pp. 11, 102).

- Kutscher, Nadia and Lisa-Marie Kreß (2016). „Internet is the same like food’ —An empirical study on the use of digital media by unaccompanied minor refugees in Germany“. In: *Transnational Social Review* 1674, pp. 1–4 (cit. on pp. 5, 24, 25, 55, 111, 121).
- (2018). „The Ambivalent Potentials of Social Media Use by Unaccompanied Minor Refugees“. In: *Social Media and Society* 4.1 (cit. on pp. 6, 111).
- Kyng, Morten (1996). „Users and Computers - A Contextual Approach to Design of Computer Artifacts“. In: *DAIMI Report Series* 25.507, pp. 7–44 (cit. on pp. 7, 43).
- Laire, Caitriona (2015). „Making Space for Ambiguity: The value of multiple and participatory methods in researching diasporic youth identities“. In: *Identities* 23.4, pp. 470–484 (cit. on pp. 40, 50, 51).
- Lazar, Jonathan, Jijuan Heidi Feng, and Harry Hochheiser (2010). *Research Methods In Human-Computer Interaction*. First Edition. John Wiley and Sons Ltd (cit. on pp. 9, 10, 12, 13, 70, 85).
- Lloyd, Annemaree, Mary Anne Kennan, Kim Thompson, Asim Qayyum, and David Bawden (2013). „Connecting with New Information Landscapes: Information literacy practices of refugees“. In: *Journal of Documentation* 69.2, pp. 121–144 (cit. on pp. 4, 5, 24, 28, 29, 55).
- Lundmark, Sofia (2016). „Connecting with New Information Landscapes: Information literacy practices of refugees“. PhD thesis. Acta Universitatis Upsaliensis (cit. on p. 48).
- MacEachren, Alan M. and Isaac Brewer (2004). „Developing a conceptual framework for visually-enabled geocollaboration“. In: *International Journal of Geographical Information Science* 18.1, pp. 1–34 (cit. on p. 36).
- Mackenzie, Catriona, Christopher McDowell, and Eileen Pittaway (2007). „Beyond ‘do no harm’: The challenge of constructing ethical relationships in refugee research“. In: *Journal of Refugee Studies* 20.2, pp. 299–319 (cit. on pp. 96, 97, 108, 119, 120).
- Mahalingam, Ramaswami and Veronia Rabelo (2013). „Theoretical, Methodological, and Ethical challenges to the Study of Immigrants: Perils and Possibilities“. In: *Frameworks and Ethics for Research with Immigrants. New directions for child and adolescent development*. Ed. by M.G. Hernandez, J. Nguyen, C.L. Saetermoe, and C. Suarez-Orozco. John Wiley and Sons Ltd. Chap. 3, pp. 25–42 (cit. on pp. 70, 85).
- Marlowe, Jay M. (2010). „Beyond the discourse of trauma: Shifting the focus on Sudanese refugees“. In: *Journal of Refugee Studies* 23.2, pp. 183–198 (cit. on pp. 20, 92).
- Mayrberger, Kerstin (2012). „Partizipatives Lernen mit dem Social Web gestalten: Zum Widerspruch einer, verordneten Partizipation“. In: *Medienpädagogik* 21 (cit. on p. 81).
- McNally, Brenna and Mona Leigh Guha (2017). „Establishing Content Expertise in Inter-generational Co-Design Teams“. In: *Participatory Design for Learning: Perspectives from practice and Research*. Ed. by Betsy DiSalvo, Jason Yip, Elizabeth Bonsignore, and Carl DiSalvo. First. New York: Routledge. Taylor and Francis Group. Chap. 15, pp. 202–210 (cit. on pp. 98, 101).
- McNally, Brenna, Matthew Louis Mauriello, Mona Leigh Guha, and Allison Druin (2017). „Gains from Participatory Design Team Membership as Perceived by Child Alumni and their Parents“. In: *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17*, pp. 5730–5741 (cit. on pp. 91–93, 99, 107, 109, 116, 117).

- Muller, Michael J. and Allison Druin (2012). „Participatory design: The third space in Human-Computer Interaction“. In: *Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications*. Ed. by Julie A. Jacko. Third Edition. Boca Raton, FL: CRC Press, pp. 1125–1154 (cit. on pp. 7, 11, 40, 42–44, 52, 64–66, 115).
- Muller, Michael J. and Sarah Kuhn (1993). „Participatory Design“. In: *Communications of the ACM* 36.6, pp. 24–28 (cit. on pp. 42, 43, 52, 66, 67).
- Mulloni, Alessandro, Hartmut Seichter, and Dieter Schmalstieg (2011). „User experiences with augmented reality aided navigation on phones“. In: pp. 229–230 (cit. on p. 122).
- Neill, Maggie (2008). „Transnational refugees: The transformative role of art“. In: *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research* 9 (2) (cit. on p. 48).
- Neill, Maggie and Ramaswami Harindranath (2006). „Theorising narratives of exile and belonging: the importance of Biography and Ethno-mimesis in 'understanding' asylum.“ In: *Qualitative Sociology Review* 2 (1) (cit. on p. 48).
- Neset, Valerie and Andrew Large (2004). „Children in the Information Technology Design Process: A review of theories and their applications“. In: *Library & Information Science Research* 26.2, pp. 140–161 (cit. on pp. 40, 66).
- Ngan, Hong Yin, Anna Lifanova, Juliane Jarke, and Jan Broer (2016). „Adaptive and Adaptable Learning“. In: 9891, pp. 521–524 (cit. on pp. 5, 21).
- Nguyen, J., M.G. Hernandez, and C. Suarez-Orozco (2013). „An Ethical Frame for Research with Immigrant Families“. In: *New directions for child and adolescent development*. Ed. by M.G. Hernandez, J. Nguyen, C.L. Saetermoe, and C. Suarez-Orozco. John Wiley and Sons Ltd. Chap. 1, pp. 1–7 (cit. on pp. 70, 71, 85, 119).
- Nöllenburg, Martin (2007). „Geographic visualization“. In: *Human-Centered Visualization Environments: GI-Dagstuhl Research Seminar, Dagstuhl Castle, Germany, March 5-8, 2006, Revised Lectures*. Ed. by Andreas Kerren, Achim Ebert, and Jörg Meyer. Berlin, Heidelberg: Springer Berlin Heidelberg, pp. 257–294 (cit. on p. 36).
- Peters, Dorian, Mark Deady, Nick Glozier, Samuel Harvey, and Rafael A. Calvo (2018). „Worker preferences for a mental health app within male-dominated industries: Participatory study“. In: *Journal of Medical Internet Research* 20.4, pp. 1–16 (cit. on p. 93).
- Peterson, Elizabeth R. and Kevin A. Barron (2006). „A Sticky Methodology: Using sticky notes to help facilitate focus groups“. In: *Description and explanation in educational and social research*. Ed. by B. Kozuh, R. Kahn, A. Kozłowska, and P. Kroepe. UCLA Press, pp. 89–100 (cit. on pp. 11, 44, 64, 76, 99).
- (2007). „How to Get Focus Groups Talking: New Ideas that will Stick“. In: *International Journal of Qualitative Methods* 6.3, pp. 140–144 (cit. on pp. 44, 64, 76).
- Phillips, Christine. (2013). „Remote telephone interpretation in medical consultations with refugees: meta-communications about care, survival and selfhood“. In: *Journal of Refugee Studies* 26.4, pp. 505–523 (cit. on p. 21).
- Ponzoni, Elena (2015). „Windows of understanding: broadening access to knowledge production through participatory action research“. In: *Qualitative Research* 16.5, pp. 557–574 (cit. on pp. 40, 50, 51, 84).

- Rohde, Markus, Konstantin Aal, Kaoru Misaki, et al. (2016). „Out of Syria: Mobile Media in Use at the Time of Civil War“. In: *International Journal of Human-Computer Interaction* 32.7, pp. 515–531 (cit. on p. 25).
- Saad-Sulonen, Joanna, Kim Halskov, Liesbeth Huybrechts, et al. (2015). „Unfolding Participation. What do we mean by participation – conceptually and in practice“. In: *Aarhus Series on Human Centered Computing* 1.1, p. 4 (cit. on p. 47).
- Saldaña, Johnny (2009). *The Coding Manual for Qualitative Researchers*. London Thousand Oaks, Calif: Sage Ltd. (cit. on pp. 11, 23).
- Schlesinger, Ari, W. Keith Edwards, and Rebecca E. Grinter (2017). „Intersectional HCI: Engaging Identity through Gender, Race, and Class“. In: *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17*. Denver,CO,USA: ACM, pp. 5412–5427 (cit. on p. 93).
- Schmitt, Paul, Daniel Iland, Elizabeth Belding, et al. (2016). „Community-level access divides: A refugee camp case study“. In: *Proceedings of the Eighth International Conference on Information and Communication Technologies and Development - ICTD '16*. Ed. by Kentaro Toyama. Ann Arbor, Michigan, USA: ACM Press, pp. 1–11 (cit. on pp. 6, 22).
- Schön, Donald A. (1983). *The reflective practitioner : how professionals think in action*. New York: Basic Books (cit. on pp. 100, 118).
- Schreieck, Maximilian, Jonas Zitzelsberger, Sebastian Siepe, Manuel Wiesche, and Helmut Krcmar (2017). „Supporting refugees in every Day life–intercultural design evaluation of an application for local information“. In: *21st Pacific Asia Conference on Information Systems (PACIS)*. Langkawi, Malaysia: Association for Information Systems (AIS), pp. 1–13 (cit. on pp. 5, 6, 21, 25, 111).
- Schweitzer, Robert, Fritha Melville, Zachary Steel, and Philippe Lacherez (2006). „Trauma, post-migration living difficulties, and social support as predictors of psychological adjustment in resettled Sudanese refugees“. In: *Australian and New Zealand Journal of Psychiatry* 40.2, pp. 179–187 (cit. on pp. 39, 55).
- Segbers, Theresa (2015). „Ethnographie als Methodologie in der Geographiedidaktik - Teilnehmende Beobachtung und Tagebuchanalyse im Kontext exkursionsdidaktischer Forschung“. In: *Geographiedidaktische Forschungsmethoden*. Ed. by Alexandra Budke and Miriam Kuckuck. Lit Verlag, pp. 294–317 (cit. on p. 102).
- Shankar, Saguna, Heather L. O'Brien, Elissa How, et al. (2016). „The role of information in the settlement experiences of refugee students“. In: *Proceedings of the Association for Information Science and Technology* 53.1, pp. 1–6 (cit. on p. 20).
- Shmatkov, Daniyil (2016). „the Use of Causal Maps As Interdisciplinary Didactic Reduction Method“. In: *Advanced Education* 6, pp. 16–21 (cit. on p. 98).
- Shneiderman, Ben (2000). „Universal usability“. In: *Communications of the ACM* 43.5, pp. 84–91 (cit. on p. 35).
- Slonim-nevo, Vered (2015). „Risk Factors Associated with Culture Shock among Asylum Seekers from Darfur“. In: *ournal of Refugee Studies* 29.1, pp. 117–138 (cit. on pp. 4, 39, 55).
- Stein, Barry N. (1981). „The Refugee Experience: Defining the Parameters of a Field of Study“. In: *International Migration Review* 15.1, pp. 320–330 (cit. on pp. 4, 55).

- Suchman, Lucy (2002). „Located Accountabilities in Technology Production“. In: *Scandinavian Journal of Information Systems* 14.2, pp. 91–105 (cit. on pp. 7, 42, 43).
- Talhok, Reem, Ana Bustamante, Konstantin Aal, et al. (2018). „HCI and Refugees: Experiences and Reflections“. In: *Interactions* 25.4, pp. 46–51 (cit. on pp. 1, 118, 120).
- Talhok, Reem, Syed Ishtiaque Ahmend, Volker Wulf, et al. (2015). „Refugees and HCI SIG : The Role of HCI in Responding to the Refugee Crisis“. In: CHI EA '15, pp. 1073–1076 (cit. on pp. 4, 6, 20, 56).
- Talhok, Reem, Sandra Mesmar, Anja Thieme, et al. (2016). „Syrian Refugees and Digital Health in Lebanon“. In: *Proceedings of the 35th Annual Conference on Human Factors in Computing Systems - CHI '16*. CHI '16. Santa Clara, California, USA: ACM, pp. 331–342 (cit. on pp. 4, 20, 23, 24, 56, 95).
- Talhok, Reem, Kyle Montague, and Patrick Olivier (2017). „Implications of Synchronous IVR Radio on Syrian Refugee Health and Community Dynamics“. In: *Proceedings of the 8th International Conference on Communities and Technologies*. CT '17. Troyes, France: ACM, pp. 1–10 (cit. on pp. 6, 20, 56, 95).
- Te Lindert, Annet, Hubert Korzilius, Fons J.R. Van de Vijver, Sjaak Kroon, and Judit Arends-Tóth (2008). „Perceived discrimination and acculturation among Iranian refugees in the Netherlands“. In: *International Journal of Intercultural Relations* 32.6, pp. 578–588 (cit. on pp. 39, 55, 63).
- Tversky, Barbara (1993). „Cognitive maps, cognitive collages, and spatial mental models“. In: *Spatial Information Theory A Theoretical Basis for GIS*. Ed. by Andrew U. Frank and Irene Campari. Marciana Marina, Elba Island, Italy: Springer Berlin Heidelberg, pp. 14–24 (cit. on p. 35).
- UN DESA (2014). *World Urbanization Prospects: The 2014 Revision, Highlights (ST/ESA/SER.A/352)*. Tech. rep. New York, p. 32. arXiv: arXiv:1011.1669v3 (cit. on p. 3).
- UNECE (2012). *Learning for the future: Competences in Education for Sustainable Development*. Tech. rep. Geneva, Switzerland: United Nations Economic Commission for Europe Strategy for Education for Sustainable Development (cit. on pp. 87, 118).
- UNHCR (1951). *Convention and Protocol Relating to the Status of Refugees*. Tech. rep. United Nations High Commissioner for Refugees (cit. on p. 55).
- (1999). *Protecting Refugees - A Field Guide for NGOs*. Tech. rep. Geneva, Switzerland: United Nations High Commissioner for Refugees (cit. on pp. 4, 111).
 - (2017a). *Global Trends - Forced Displacement in 2016*. Tech. rep. June. Geneva, Switzerland: United Nations High Commissioner for Refugees (UNHCR), pp. 1–72 (cit. on pp. 4, 55).
 - (2017b). *Global Trends Forced Displacement in 2016*. Tech. rep. United Nations High Commissioner for Refugees (cit. on pp. 19, 55).
 - (2017c). *Global Trends - Forced Displacement in 2017*. Tech. rep. Geneva, Switzerland: United Nations High Commissioner for Refugees, pp. 1–76 (cit. on pp. 4, 92).
- Vines, John, Rachel Clarke, Tuck Wah Leong, et al. (2012). „Invited SIG - Participation and HCI: Why Involve People in Design“. In: *Extended Abstracts of the 2012 ACM SIGCHI Conference on Human Factors in Computing Systems*. CHI '12. Austin, TX, USA: ACM, pp. 1217–1220 (cit. on p. 53).

- Vines, John, Rachel Clarke, Ann Light, and Peter Wright (2015). „The beginnings, middles and endings of participatory research in HCI: An introduction to the special issue on perspectives on participation“. In: *International Journal Human-Computer Studies* 74, pp. 77–80 (cit. on pp. 7, 46, 50).
- Vines, John, Rachel Clarke, Peter Wright, John McCarthy, and Patrick Olivier (2013). „Configuring Participation: On How We Involve People in Design“. In: *Proceedings of the 31st Conference on Human Factors in Computing Systems*. CHI '13. Paris, France: ACM, pp. 429–438 (cit. on pp. 44, 47, 52, 116).
- von Unger, Hella (2012). „Participatory Health Research: Who Participates in What?“ In: *Forum Qualitative Sozialforschung / Forum Qualitative Social Research FQS* 13.1 (cit. on pp. 40, 47, 48, 50–52, 69).
- (2014). *Partizipative Forschung*. Springer Fachmedien Wiesbaden (cit. on pp. 40, 47–50, 52, 67, 69, 77, 81).
- Walsh, Greg, Allison Druin, Mona Leigh Guha, et al. (2010). „Layered Elaboration: A New Technique for Co-design with Children“. In: *Proceedings of the 28th Conference on Human Factors in Computing Systems*. CHI '10. Atlanta, Georgia, USA: ACM, pp. 1237–1240 (cit. on p. 44).
- Walsh, Greg, Elizabeth Foss, Jason Yip, and Allison Druin (2013). „FACIT PD: A Framework for Analysis and Creation of Intergenerational Techniques for Participatory Design“. In: *Proceedings of the 31st Conference on Human Factors in Computing Systems*. CHI '13. Paris, France: ACM, pp. 2893–2902 (cit. on p. 45).
- Weibert, Anne and Volker Wulf (2010). „All of a sudden we had this dialogue...“: intercultural computer clubs' contribution to sustainable integration“. In: *Proceedings of the 3rd international conference on Intercultural collaboration - ICIC '10*. Ed. by Pamela Hinds, Anne-Marie Søderberg, and Ravi Vatrapu. Copenhagen, Denmark: ACM Press, pp. 93–102 (cit. on pp. 5, 6, 21, 95).
- Westoby, Peter (2008). „Developing a community-development approach through engaging resettling Southern Sudanese refugees within Australia“. In: *Community Development Journal* 43.4, pp. 483–495 (cit. on p. 48).
- Wilding, Raelene and Sandy Gifford (2013). „Introduction to the special issue on forced displacement, refugees and ICTs: transformations of place, power and social ties“. In: *Journal of Refugee Studies* 26.4, pp. 495–504 (cit. on p. 22).
- Wolters, Maria K., Zawadhafsa Mkulo, and Petra M. Boynton (2017). „The Emotional Work of Doing eHealth Research“. In: *Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems - CHI EA '17*. Denver, CO, USA: ACM, pp. 816–826 (cit. on p. 93).
- Wright, Michael, Hella von Unger, and Martina Block (2010). „Partizipation der Zielgruppe in der Gesundheitsförderung und Prävention“. In: *Partizipative Qualitätsentwicklung in der Gesundheitsförderung und Prävention*, pp. 35–52 (cit. on pp. 49, 50, 52, 54, 67, 68, 81, 83, 115).
- Xu, Ying and Carleen Maitland (2016). „Communication behaviors when displaced: A case study of Za'atari syrian refugee camp“. In: *Proceedings of the Eighth International Conference on Information and Communication Technologies and Development - ICTD '16*. Ed. by Kentaro Toyama. Ann Arbor, Michigan, USA: ACM Press, pp. 1–4 (cit. on pp. 20, 25).

Xu, Ying, Carleen Maitland, and Brian Tomaszewski (2015). „Promoting Participatory Community Building in Refugee Camps with Mapping Technology“. In: *Proceedings of the 7th International Conference on Information and Communication Technologies and Development*. ICTD '15. Singapore, Singapore: ACM, 67:1–67:4 (cit. on p. 56).

Yerousis, George, Konstantin Aal, Thomas von Rekowski, et al. (2015). „Computer-Enabled Project Spaces: Connecting with Palestinian Refugees across Camp Boundaries“. In: *Proceedings of the 33th Conference on Human Factors in Computing Systems*. CHI '15. Seoul, Republic of Korea: ACM, pp. 3749–3758 (cit. on pp. 5, 6, 21, 56, 95).

Websites

Eurostat (2016). *Asylum Statistics*. URL: http://ec.europa.eu/eurostat/statistics-explained/index.php/Asylum_statistics (visited on June 27, 2016) (cit. on p. 55).

UNESCO (2017). *Migrant - United Nations Educational, Scientific and Cultural Organization*. URL: <http://www.unesco.org/new/en/social-and-human-sciences/themes/international-migration/glossary/migrant/> (cit. on p. 55).

What is forced migration? (2012). URL: <http://www.forcedmigration.org/about/whatisfm/what-is-forced-migration> (visited on Feb. 23, 2016) (cit. on p. 55).

Supplementary Material

Repositories and Student Thesis

The research results of this thesis, which did not put at risk the identity of the participants, can be found in Geo-C project repositories referenced below.

- **GEO-C Project.** These repositories have been built by the team for the present thesis as part of the H2020-ITN-MSCA GEO-C project. The contributions of this thesis are marked in these repositories as part of ESR 03's research (i.e., ESR 03 is this author's reference number within the project).

- GitHub: <https://github.com/geo-c/>
- ZENODO: <https://zenodo.org/communities/geoc/>
- CKAN: <http://giv-oct.uni-muenster.de:5000/>

Two student assistants and a master student's thesis have contributed to this thesis.

- **Apurva Anil Kochar:** M.Sc. Thesis part of the Erasmus Mundus Master program in Geospatial Technologies. Title: *Using Map-Augmented Reality for Forced Migrants*. University of Münster (WWU), submitted on February 25, 2017. Repository: <https://github.com/apurvaakochar/MasterThesis>
- **Lasse Einfeldt:** Bachelor student who worked as a student assistant developing one of the two available open-source geospatial prototypes part of Contribution No. 4 of this thesis. This prototype was developed on the prototype done as part of Apurva Kochar's master thesis. Repository: <https://github.com/geo-c/OCT-RefugeeApp>

- **Markus Konkol:** Master student who worked as a student assistant developing one of the two available open-source geospatial prototypes part of Contribution No. 4 of this thesis. The prototype of the mobile geospatial app developed is entitled *WelcomeMS* and can be found in the GEO-C project's GitHub repository. Repository:<https://github.com/geo-c/OCT-WelcomeMS>

Participatory Workshops Material

All the material used for the participatory workshops (e.g., slides, templates, privacy boards, reflective questionnaires, Likert-scale questionnaires, templates for consent forms) are available upon request to the researchers' e-mail addresses: bustamante@uni-muenster.de or anitabdp@gmail.com.

Curriculum Vitae
Ana Maria Bustamante Duarte

personal data

📍 dorotheenstraße 11, 48145, Münster, Germany 📞 +49 1520 921 3303
🌐 Bogotá D.C, Colombia 📅 May 31, 1988 📧 bustamante@uni-muenster.de

education

2015 - 2018
Ph.D Candidate in Geoinformatics
University of Münster (WWU), Germany

2011 - 2013
Master- Erasmus Mundus in "Restructuration Urbaine"
École National Supérieure d'Architecture de Paris-La Villete, France

Partner universities: École National Supérieure d'Architecture de Paris-La Villete, Universidad Politécnica de Valencia, Università Mediterranea degli studi di Reggio Calabria.

2004 - 2009
Bachelor's Degree in Architecture
Universidad de Los Andes, Colombia

2000-2003
High school diploma
Instituto Alberto Merani, Colombia

professional experience

2015
Consultant in Technical Assistance
UN-Habitat, Colombia

2013-2015
Graduate Assistant in Territorial Analysis
CIDER/Universidad de Los Andes + UNDP, Colombia

2009-2010
Technical Adviser
Universidad de Los Andes, Colombia

2007
National Director of Construction
TECHO, Colombia

scholarships & academic awards

scholarship / 2015-2018
Marie Curie Skłodowska Fellowship

Partner universities: Westfälische Wilhelms -Universität Münster (WWU), Nova-IMS Universidade do Lisboa (NOVA), Universidad Jaume I (UJI).

scholarship / 2011-2013
Erasmus Mundus Scholarship

academic award / 2009
Meritorious recognition BSc graduation project

Münster, August 31, 2018

