Participatory Design and Participatory Research: An HCI Case Study with Young Forced Migrants

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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.

CCS Concepts: • **Human-centered computing** → **Participatory design**; *Human computer interaction (HCI)*; • **Social and professional topics** → *Cultural characteristics*;

Additional Key Words and Phrases: Vulnerable communities, forced migrants, participatory research

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 [25, 74, 75, 81]. 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 YFMs 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 [39, 63]. 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 [23]. The nature of PD promotes the empowerment of users [48] and their role as design partners [30]. Due to this characteristic, it is widely used to approach and develop projects with vulnerable communities such as children [30, 46], older adults [50], and rural communities in developing countries [21]. There are also a few reports on its use in projects with groups of migrants and forced migrants in different setups [1, 33–36]. Furthermore, PD facilitates the inclusion of diverse voices in the design process, i.e., researchers, users, designers, developers [15, 39, 63, 67]. While PD has been successfully applied to different (vulnerable) communities, its use with forced migrants, particularly YFMs requires further explorations.

Similar to PD, PR has also been used to work with vulnerable communities [57, 72, 89]. 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 [10]. 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 [90]. 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 YFMs 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 and 18 years old located in Münster (Germany), and which ran over a period of 4 weeks in 2016.

The remainder of this article is structured as follows. In Section 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 outlines the broader context of our research by describing the case study and its participants in more detail. Section 4 reports on the series of workshops that we held over the course of the project. It also analyzes how different aspects of PD and PR were considered during the research, and it highlights relevant ethical considerations when working with YFMs. Section 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 6 discusses a series of aspects for further evolving the method

and proposes a set of lessons learned. The final Section 7 briefly summarizes our contributions and identifies promising future work based on our findings.

2 RELATED WORK

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

2.1 Participatory Design

PD can be understood from different perspectives and fields, including computer science. It was initially included under the "cooperative design" [42] and based on the Scandinavian experience designing systems [15, 42]. It was expected to aid the development of systems that supported users activities, e.g., how they work, and how they interact [39].

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 different experience levels [39, 42]. 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 [63].

Within this general framework, PD has five fundamental aspects that were identified by Halskov and Brodersen [42]. 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 [15, 39, 42, 63], which relate to Halskov and Brodersen's fundamental aspects in PD. These key elements are as follows:

(1) *Diverse participation and democratic decision-making.* PD in computer science results from the goal of promoting democracy in the workplace [39, 42, 63]. 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., [39, 50, 54, 63, 64]). 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 [16, 39, 63, 64, 77]. 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 [39]. Halskov and Brodersen [42] 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 [30, 63]. In the PD projects with these groups (e.g., children [30, 48]), 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 [56] 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 [63]. In this space,

the participants do not take opposing roles and perspectives trying to find a middle ground [63]. On the contrary, with the use of certain methods, participants' positions and choices can change freely in different moments [63]. To generate mutual knowledge and possible alliances [63] participants need to go beyond their situation, their own experiences, which in general poses a challenge for every PD process [77].

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 [50]. 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 [50].

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 [39]. 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 [64].

(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 [50]. Referring to this aspect, Halskov and Brodersen [42] mention that participatory processes are sequential, and that they connect spaces of transition where interpretation, planning, and decision-making happened. Moreover, Joshi and Bratteteig [50] consider PD as an iterative process that 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 et al. [88] 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 et al. [88] highlight the challenge facing PD process of making clear to the participants how their voices will be represented and used within the design process. Last, 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 [42] 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 [42]. Several of these methods have been created and mostly employed in different HCI waves, mainly in the second and third [17, 18]. For example, wood or paper mock-ups [14], prototyping, and group workshops [39,

53, 63] are having a significant impact on the implementation of "third wave" projects. Bødker [17] 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 [70, 71], layered elaboration [91], storytelling (group [51] or individual), and theater play [92]. Nonetheless, as Kensing and Munk-Madsen [54] 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 [42], 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 [50] conducted a PD study for 3 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 [29–31]. In [30], Druin evaluates the particular role children have in PD processes related to new technology development. In that study, Druin [30] 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 [33–36]. For instance, Fisher et al. [33] 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 [33]. Also, Fisher and Yefimova [35] 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 [35]. The authors discovered that young Syrian refugees played a major role in this process [35]. 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., PR and participatory action research (PAR). PR is introduced in the next section.

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 [10], PR methods are generally "geared towards planning and conducting the research process with those people whose life-world and meaningful actions are under study." In PR, 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 [10].

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 [10].

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 [10].

While PR is a well-established research method in the social sciences, it is relatively new to HCI research (but increasingly popular) [87]. It has yet to define its specific characteristics in HCI, which is a discourse that was recently initiated by Vines et al. [87]. 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 [43]. Action research also shares with PR the idea of involving practitioners democratically [43] 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 [10]. 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 PAR [10], 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 [42, 73]. In practice, PR and PD in HCI often overlap, which is why some authors also use the term "participatory design research" [42]. Vines et al. [88] 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 [10] summarize these principles of PR as follows:

(1) *PR demands democracy.* Democratic working processes are crucial for an efficient and equitable research process when working with underprivileged and vulnerable communities. von Unger [90] 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 PR Network in the late seventies [24]. 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" [89], 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"* [10]. 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" [89].

The question who should be involved in PR depends on the experiences and voices that 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. Dantec and Fox [27] stress the importance of these 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" [60] in order to empower them to change the practice or living conditions of themselves as well as their peers.

In this sense, von Unger [90] 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 the following 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 [90]. By these measures, the co-researchers can develop competencies that empower them to engage in long-term social participation [90] 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 [10]. Creating a "safe space" is of utmost importance when working with vulnerable, such as sexual assault survivors [22], children [41] or refugees [65, 66, 93].

(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 [5]. One of the most frequently used ones is Wright et al.'s [94] "stage model of participation" (Figure 1).

In this model, nine levels are specified to define participatory processes [90]. 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 [90]. Within the stage of participation, Wright et al. [94] 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 [90]. Consequently, only levels six to eight qualify for an actual participation of all partners, as demanded by PR.
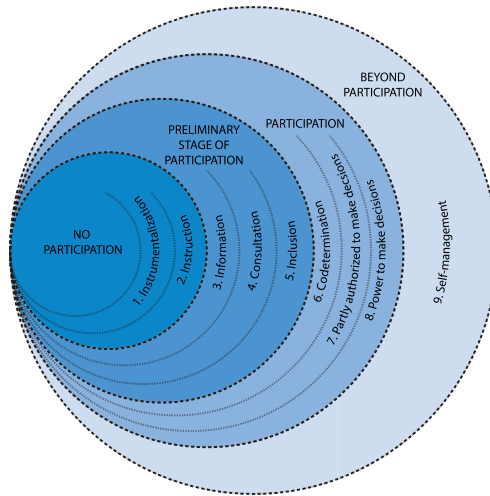
Fig. 1. Stage model of participation based on Wright et al. [94] (also translated into English).

According to von Unger [90], 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 [90]. Wright et al. [94], 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 [87]. Also, the concept of participation is often defined differently in the HCI-PR literature [42]. This is why it is crucial to discuss and reflect on the degree of participation in a study [87].

(5) *Dual objective.* According to von Unger [90], another essential characteristic of PR is to comprehend social reality on 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 [90].

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 [57] carried out a study targeting young migrants in Ireland with returning Irish families. Ponzoni [72] conducted a research project with an immigration organization and parenting support services in Amsterdam. The PaKoMi-study [89] 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 [89].

von Unger [89] determined several challenges and recommendations for future PR-based projects involving migrants. First, the author reported problems of miscommunication 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. Second, von Unger [89] stressed the importance of using every participants 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 [10]. However, von Unger 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 [89] 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." [89] 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 [57] stressed the importance of considering the effect on the members of the vulnerable community who participate in a PR project. They state that this is 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 [72], 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 [72].

2.3   Summary

The above subsections have focused on aspects of PD and PR that are relevant to HCI research with YFMs. As PD can facilitate mutual learning [63], 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 [64], which in turn could enhance collaborative "knowledge acquisition" [64] 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 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., [90, 94]. 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 [89]. The creation of a "safe space" can address this problem, especially when working with YFMs. It requires a careful selection of
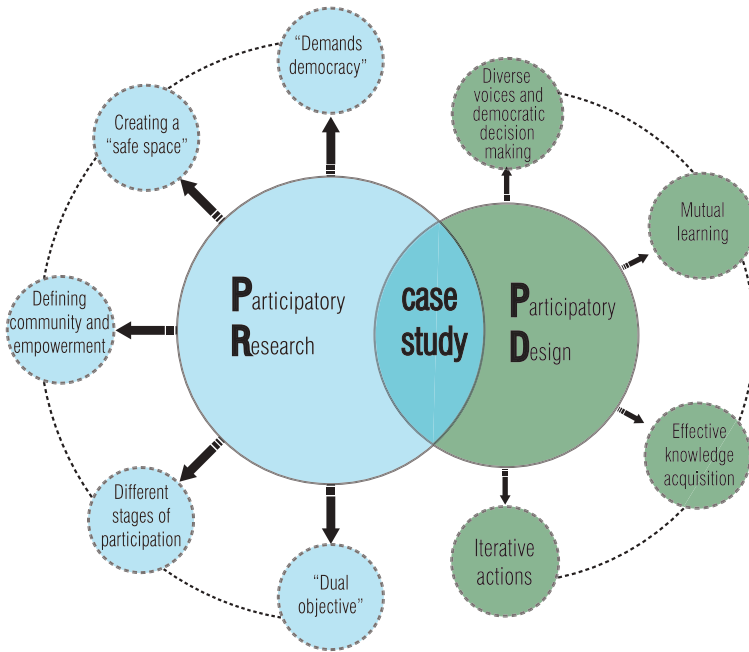
Fig. 2. Components from PD and PR considered for our case study.

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 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, whereas 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 et al.'s [88] questions regarding the definition of the panel of 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 [86].

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 YFMs and members of the host community.

—Defining and balancing the appropriate levels of participation of each actor, based on Wright et al.'s model [94], for the diverse research and design stages and related decisions.

—Establishing "safe spaces," where YFMs, 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 YFMs. 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 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.

3.1 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 [69, 83]. 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) [69, 84]. 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 [84].

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 [85]. 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 [32, 85]. 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 [76] 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 [25, 49, 74–76, 81]. Since forced migrants often have a 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 [59]. These kinds of barriers can at least partially be addressed by the use of technology.

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 [4, 9, 20, 52, 55]. However, accessing and understanding the information in the host country often require skills that can be beyond the forced migrants' proficiency of the local language, and occasionally, their literacy competency [59].

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 [95], a human-in-the-loop translation tool for refugees' transient use [19], refugees' health care provision [78, 80], navigation of new places [7], and general ICT design processes [3, 35, 36]. 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. [96] and Aal et al. [1]. 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 Talhouk et al. [79], 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 [79].

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 [42]). 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 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 [6]. 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 2014–2016, many schools in North-Rhine 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.
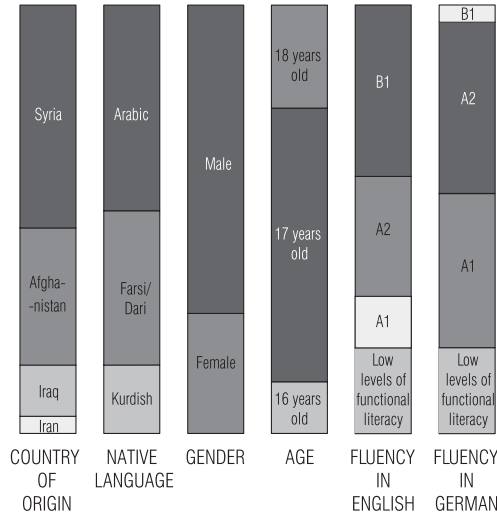
Fig. 3. Demographics of the young forced migrants participants.

Two groups of students who had enrolled at a vocational school took part in the case study. One group consisted of 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 5 workshops. From the workshops with the local students, approximately 20 participants were present in all 4 sessions in which they were involved, i.e., 2 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 an average, 7 female and 18 male YFMs participated in the activities who were registered at the school. The ages of all participants varied between 16 and 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.), and A1 (3 part.). With respect to German, the participants' proficiency levels were B1 (1 part.), A2 (10 part.), and A1 (9 part.) (Figure 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 6 months. Nonetheless, some participants had been in Münster longer than that and up to 12 months.

Only 5 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 and 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.

4 METHODOLOGICAL CONSIDERATIONS

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), 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 YFMs' 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. To each question, which was written in a simple language, 20–30 minutes were initially assigned. 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 (Section 4.2) and attached them to the large paper so that it was visible to all.

We organized two brainstorming workshops. A total of 19 YFMs 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 YFMs' 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 YFMs 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 4 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

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

can is 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 YFMs 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 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 YFMs 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 (UIs) and the YFMs' prior experiences using mobile applications. During this workshop No. 5, we did a debriefing with the collaborators through group discussion and three open questions, and a wrap-up of all the activities.

Last, 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., UI design workshops with a first prototype based on these workshops results.

Figure 4 shows an overview of the combination of methods that we used.

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 Section 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., YFMs 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 (Section 3.3).

Engaging YFMs to participate in the case study can be challenging. Aarhus et al. [2] mentions that this issue becomes more pronounced when the users belong to disadvantaged groups, in the author's case elderly population. Aarhus et al.'s 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 as follows:

— *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
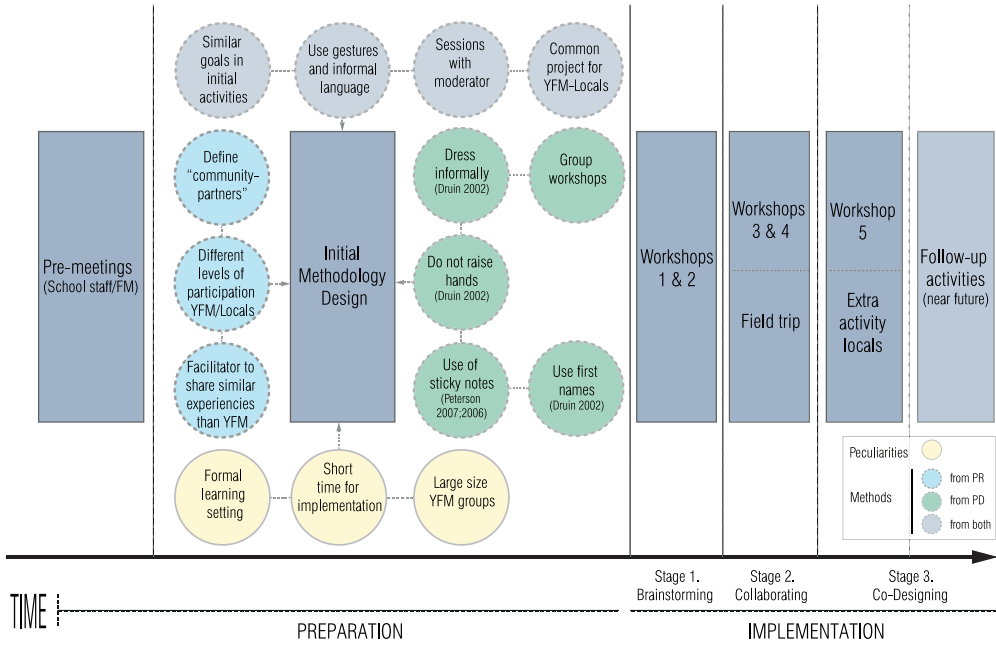
Fig. 4. Overview of methods used in the case study with young forced migrants with limitations.

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 YFMs 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.'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 [70] 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" [71]. 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, we decided to use group workshops [39, 53, 63] as the main strategy for the case study with YFMs in a school setting. Greenbaum [39] defined group workshops as agents that promote peoples 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 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 [39]. 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 YFMs, host community, and researchers.* In this research space, described in Section 4.1, we proposed exercises to promote the exchange of experiences, needs, and ideas as well as exchange of social interactions among YFMs, 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* [63]. Muller and Druin [63] state that this characteristic allows participants to locate themselves in situations that are not familiar for them to carry out processes of collective negotiation to have a shared knowledge alongside a commonly designed artifact. Each of the workshops included actions that 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

Fig. 5. Images of workshop No. 3—joint activity between young forced migrants and local students.

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 that were discussed in previous activities. Through the wireframes, we intended to engage all parties in the design process actively and endorse adequate knowledge procurement [64] 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 [67]. 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 [40, 63, 67] (Figure 5).

(3) Iterative conditions. The iterative, flexible, and general character of PD promotes the idea of children and adolescents as peer co-designers [30, 67]. These characteristics make PD a highly suitable approach to elaborate design actions with young population [67]. As stated in Section 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 [64] 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 UI and content design.

4.3   Elements from Participatory Research

As for the part of our case study rooted in the PR approach, we considered the following elements of PR as defined by Bergold and Thomas [10] and von Unger [90].

(1) PR 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.,
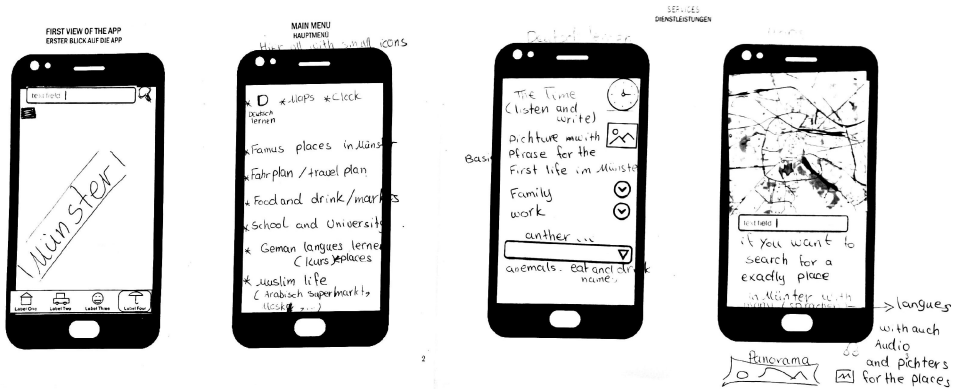
Fig. 6. Image of a paper-based wireframe created by one of the participants of the YFMs group.

in the sense of levels 6–8 defined in Wright et al.'s "stage model of participation" [94] (Figure 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 spent considerable time on studying and applying various analysis methods. As von Unger [90] 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 (Wright et al.'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 Wright et al.'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 Wright et al.'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 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 Wright et al.'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., Wright et al.'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 [10]. 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. First, we considered that some YFMs 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. Second, 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 participants statement and continuously encouraged constructive criticism towards the facilitators role or actions. Third, 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 YFMs 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 YFMs 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." YFMs 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" [89]. We targeted forced migrants at school age to collaborate with us. Most in this group of co-researchers had arrived in Münster less than 6 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 [90] (Section 2.2). The goal of the methods proposed in the study is on one hand to gain knowledge about YFMs' 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 Section 6.2.

4.4   Ethical Considerations

Existing ethical recommendations from projects specifically related to carrying out research with migrants [44, 61, 68], as well as from HCI research ethics in general [58] 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 YFMs requires a step-by-step process to gain the trust of the community [44, 61, 68]. 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 that 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 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 5 (Figure 7).

5   RESULTS

This section presents the challenges and the opportunities we identified while using a combination of PD and PR strategies with YFMs 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 article are literal transcriptions of their statements in

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	Transcend Cross-cultural Comparisons
	Background (e.g. cultural, educational)	Understanding of Cultural Practices (e.g. mental representation and situated practice)	Ensure That Participants Are Not at Risk	Throughly Evaluate the Linguistic Translation of Instruments and Protocols (interact in their native language)
	Linguistic Differences		Support The Participants Experiences and Sociocultural Viewpoints	
	Migration history	Avoid The Cultural Deficit Model		Informed Consent Procedures (e.g. level of education, sociocultural context)
		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		
	Background Questions		Immigrant as Research Collaborator	
	(Nguyen et al, 2013)	Ensure Understanding of Research Procedures (Mahalingam et al, 2013)	Triangulation in the Study Design (Hernández et al, 2013)	

Fig. 7. Ethical considerations with immigrant population based on [44, 68].

the original language they expressed those.[2] To present the outcomes, we use a series of acronyms: YFM_P# for quotes from specific YFMs, 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.

5.1 Challenges of Participatory Design and Participatory Research

The challenges present in this 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 that 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 endeavors. An opinion that 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.

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[2]For further information on the data collected by this study please contact the authors' of this article.

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. In total 65% of them highlighted this issue as the most significant challenge through their open questions' answers. They identified as the primary 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, UI, and data visualization. We also recognize YFMs relied heavily on their acquired knowledge and on their own smartphones' UIs 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 UI 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. A total of 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 YFMs were a good opportunity to establish relations with newcomers in the city. In total 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 YFMs in several activities (Q4), 55% 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 YFMs and host communities together in a HCI-related project (Section 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 Section 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.

5.2 Opportunities of Participatory Design and Participatory Research

A set of opportunities were identified, mainly by YFMs 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 YFMs 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 YFMs. In total 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 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 teammates 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 Section 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 participants 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 [70, 71]. 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 sat what they intended to say?).

People-driven adaptation of the research goals. Applying 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 [38] 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 3 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 [90] and the International PR Network [24], 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 YFMs community. In total 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). In total 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.

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 UI 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 YFMs 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 they 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 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.

6 LESSONS LEARNED

From the results reported in the previous section, we can draw a number of lessons that are relevant for future HCI projects applying a combination of PR and PD processes with YFMs. These lessons should be examined in the light of the peculiarities and limitations of this case study (Section 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.

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 YFMs in a school setting. Our results indicate that the majority of YFMs 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 10 and 9 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" [62]). 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 Wright et al. [94]). von Unger [90] 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 [30]. 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 Druins [30] 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 Section 5.1, the relatively short duration of the study limited the projects effectiveness for balancing the roles among the diverse stakeholders. Holone and Herstad [45] suggested that increasing the time available during the PD 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 that are only in the first stages of reaching the community.

— *Repeatedly emphasizing the use of anonymization when working with underage 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 that 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 YFMs. 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).

Three out of six sessions in total were joint activities between all relevant stakeholders (i.e., brainstorming, presenting, and collecting) (Section 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 2) was based on Wright's [94] suggestions. Despite the different levels of participation (Section 4), the contributions of the YFMs and the local students were equally valuable. YFMs provided their challenges and needs while familiarizing themselves with the city,

whereas 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 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 since dealing with multiple languages could possibly difficult the implementation of the activities. Our case study showed that collecting challenges and needs of YFMs 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. In total 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 YFMs 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 PR and PD 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 [72]. 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 [28]). In summary, these results emphasize the importance of using creative methods that 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 Section 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 5, it took 4 weeks to get all written consent forms for YFMs signed. As a comparison, only 2 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., [44, 58, 61, 68]). 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.

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. Dantec and DiSalvo [26] 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 [42] 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. [13] 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., [12]), but its application to PD for useful systems (where design decisions involve necessary choices and tradeoffs) needs further investigations in future work. The question of "how inclusive is agonistic PD?" also has not been conclusively answered at this time [13].

(2) More discussion is needed regarding the notion of "safe space" in PD research. As discussed in Section 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 discussion the implementation of PD (e.g., [11, 47]). 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 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 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 YFMs, 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" [8, 37]. 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 [39] 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 that 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" [82]). Second, based on the YFMs' 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" [82]. Third, by leaving important research decisions to the YFMs co-researchers, we aimed to "achieve transformation" [82] 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.

7 CONCLUSION AND FUTURE WORK

In this article, we reported on the participatory methods we used in a case study with YFMs to gain a deeper understanding of advantages and disadvantages of using PD and PR with this group. We also gathered initial insights regarding their needs and the requirements for a technology-based tool that 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 YFMs). 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" [13] 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 YFMs. 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 YFMs 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 YFMs in PR and PD processes in HCI projects.

STATEMENT OF PREVIOUS RESEARCH

I, Ana Maria Bustamante, state that the present TOCHI submission has no relation to any additional prior papers. I, Nina Brendel, state that the present TOCHI submission has no relation to any additional prior papers. I, Auriol Degbelo, state that the present TOCHI submission has no relation to prior papers. I, Christian Kray, state that the present TOCHI submission has no relation to prior papers in terms of PD and forced migrants as user group. While I have published on various aspects of HCI, in particular user-centered design and interaction with mobile applications, the contribution in this article is distinct from my previous publications—in particular with respect to the combination of concepts from diverse fields to achieve a better engagement and understanding of a vulnerable community.

Moreover, we confirm, that this article has not been previously submitted to any other conference or journal.

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